City of Santa Clara
1500 Warburton Ave
Santa Clara, CA 95050

City of Santa Clara Water Utility

2005 Urban Water Management Plan

Ensuring a high quality supply of water for the community

Adopted November 15, 5005
City of Santa Clara Resolution Number 7284

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Acknowledgements

A report, such as this Urban Water Management Plan, is seldom the work of a single individual. The 2005 Urban Water Management Plan (UWMP) is no exception. The UWMP was a collaborative effort of several staff members of the Water and Sewer Utilities. We would like to acknowledge the many hours and hard work of the following individuals who contributed to this report

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We would also like to thank the numerous other individuals within the City of Santa Clara whose knowledge, experience, insights and comments were instrumental in the preparation of this UWMP.

CITY OF SANTA CLARA

2005 URBAN WATER MANAGEMENT PLAN

Executive summary

The City of Santa Clara has a long history of providing clean and abundant supplies of water for the residents and businesses in Santa Clara, beginning in 1895. Growing needs for water over the years have been met by finding new supplies: primarily by adding new wells to tap our groundwater resources and, since the 1960's, by delivery from the two supplies of imported water provided by San Francisco Water Department (SFWD) and the Santa Clara Valley Water District (District).

Several areas of concern and challenge must be successfully managed to continue meeting the needs of the community. These areas of concern primarily fall under the broad categories of water supply (quantity), of health and safety (quality) and infrastructure replacement (system reliability).

Water Supply

With projections for water demand used in this study of 1.5 % average annual growth for the next 5 years and slower grow thereafter, the City of Santa Clara will continue to enjoy sufficient water availability from our four sources (three of potable water and one recycled source) to maintain the ability to deliver water to our community. This capacity is assured for the next ten to twenty years. Supplies are projected to be sufficient for all but the more severe drought years. The District in their *2005 Urban Water Management Plan* (UWMP) has stated that they will be able to provide all water demands for the County (including the City of Santa Clara) even in drought scenarios required for their UWMP[1]. However, SFWD projections indicate as much as a 42% shortfall in the event of a multiple year drought similar to the 1986-1991 drought. The City of Santa Clara has an interruptible contract for water deliveries from San Francisco; however, the *Interim Water Supply Allocation Plan* (a multi-party agreement adopted in 2001 between the City, San Francisco and 27 other agency members of Bay Area Water Users Association) provides the City of Santa Clara with an assured share of the City's usual supply from SFWD; this is currently 42% according to the allocation formula. Although the City of Santa Clara could increase pumping from the underground aquifers to offset any short-term reduction in imported supplies, there are undoubtedly some limit to the firm yield from groundwater pumping and the City would need to participate in any regional effort towards water rationing. This plan addresses even more severe curtailment of water supplies that may result from a regional disaster.

While water supplies will be available through all but the driest years, the cost for new supplies for our region will be ever increasing as water becomes progressively scarcer throughout the State of California. In addition, both SFWD and the District are expected to be replacing or improving aging infrastructure and water treatment facilities. In particular, SFWD has identified projects for system replacement and improvements that could cost more than $3.5 billion over the next ten years. These expenditures are needed to improve both reliability and capacity in the system for all suburban water customers of SFWD. The costs for these improvements must be repaid by increases in the wholesale water rates. If all of the improvements are completed and added to the rate base, the wholesale cost of water from San Francisco will become more than three times the current rate. While this supply is currently only 16% of the City of Santa Clara's water supply, the future high costs for this portion of the City's water supply raises issues to be met by future policy

[1] The District's 2004 *Integrated Water Resources Plan* uses a goal for investments in water supplies to insure that there is never a water shortage greater than 5% in any given year.

decisions about whether to continue to take as much, or any, of SFWD supply and, if taken, how to incorporate the expected high wholesale cost into the City's retail water rate structure. All current contracts with San Francisco for wholesale water supplies will expire in 2009. Negotiations for new contracts will begin in 2006.

Any decision to reduce or eliminate SFWD supplies will pose new problems in obtaining added supplies from the City's only other sources: groundwater and District treated water. Several improvements to the City's water system will need to be designed and constructed over the next few years to allow an increase in the capacity to receive and convey added water supplies from District treated water. Two new wells are under construction to serve the area north of the Bayshore Freeway and to help mitigate any potential loss of SFWD water.

The District has completed an update of their *Integrated Water Resource Plan.* The District has also prepared their own *2005 Urban Water Management Plan* These documents help define the future water supply for Santa Clara County including quantities to be available to the City of Santa Clara. Portions of their Plan are incorporated in this Plan, as well as information from their July 2001 *Groundwater Management Plan*.[2] The District's sources of supply will be particularly important in the event of the loss of SFWD water, either from natural disaster or policy change.

Recycled water offers one important new non-potable supply, a fourth source of water for the City and the region. The City is part owner of the South Bay Water Recycling Project (SBWRP), funded primarily by sewer utilities tributary to the San Jose – Santa Clara Water Pollution Control Plant. While recycled water is not intended to replace potable in all cases, it does provide a reliable drought-proof supply. It is approved by the State for "unrestricted use" and, as such, it does replace potable supplies for landscape irrigation and certain industrial uses. With the current distribution system, more than 10 percent of the City's total annual water demand is being met with recycled water.

Water Quality

All water provided by the City from the three potable sources continues to meet or better all State and Federal water quality standards. As stated above, the recycled water meets "unrestricted use" as defined by the State's Title 22. These standards have historically been growing ever more stringent. Future regulations and standards may require more extensive and expensive water treatment. While the City's groundwater continues to provide excellent quality water without any treatment, future State or Federal regulations could be imposed that would mandate some treatment, such as chlorination and/or fluoridation. Any costs for such "well-head treatment" have not been included in current water cost projections. The District is currently constructing improvements to the county's three water treatment plants. These improvements are intended to meet new State and Federal standards and regulations for treated surface water supplies and to improve the taste and odor of the treated water. Where costs for these water quality improvements have been identified for SFWD and District supplies they have been included in the future water cost projections for the City of Santa Clara.

System Reliability

The City of Santa Clara is dependent on three sources of potable water and one of recycled water; all of these supplies have some possibility of interruption and differing degrees of reliability. According to engineering studies a major seismic (earthquake) event could interrupt the delivery of water from the San Francisco Hetch Hetchy system for up to 2 months. A similar review of the District's potable and raw water delivery systems indicates a 2-week interruption of potable treated

[2] The District has stated their intent to prepare an updated Ground Water Management Plan in 2006.

water deliveries to the City. Current proposals include major capital improvements to both regional water systems for increased reliability. The reliability of the District's imported supplies (State and Federal water projects) is also threatened by possible failure of the Sacramento delta's levee systems, with interruptions possible for several months. Regional power supplies could also be interrupted, however the City has sufficient back-up power generation capacity to provide the expected potable water demand from City-owned wells and water storage tanks. This groundwater source can sustain the entire City's water demand for a limited period of time: that is for months, but not years.

The recycled water system serves primarily irrigation and some industrial customers. In an emergency that may interrupt the recycled water service, industrial customers have back-up potable water services; landscaped areas can probably survive the time required for reinstatement of recycled water service.

The City's internal distribution system would also be compromised by a major seismic event. Since the majority of the City's growth has occurred over the past 40 to 50 years, and these distribution pipelines are networked throughout the City, the redundancy and reliability of the system should limit any interruptions of water service to those users that are nearest to any one pipeline break. An assessment of the vulnerability of the City's water system conducted in 2004 gave the water system fairly high marks for system security and reliability.

On all three counts, water supply, water quality and system reliability, the City has the ability to meet the needs of the community for the foreseeable future. The community must in turn be prepared to meet the fiscal requirements to support and fund the utility with retail water rates that are sufficient for these requirements.

Table of contents

Table of Tables

Table of Figures

Appendices

Introduction

The Urban Water Management Planning Act requires the preparation of an Urban Water Management Plan every five years by all water utilities serving more than 3,000 customers or supplying more than 3,000 acre feet annually. The City of Santa Clara meets this criterion and prepared an UWMP in 2000. This current UWMP examines and updates the City's water demand projections, available supplies and implementation of conservation programs based on the changing conditions and new regulatory requirements enacted since the 2000 UWMP was prepared

Long range water supply planning is critical to the state of California and the City of Santa Clara in order to assure the long-term reliability and sustainability of the high quality water supplies that the public expects and on which the future of City relies. The City has taken great pride in providing reliable, high quality water at a reasonable price for the residents and businesses that call Santa Clara home.

This 2005 Urban Water Management Plan was prepared in compliance with the requirements of current Urban Water Management Act and under the guidance provided by the California Department of Water Resources.

Plan Preparation

Coordination of the UWMP Preparation

This UWMP was prepared in coordination with the two water wholesalers (San Francisco PUC and the Santa Clara Valley Water District) from which the City of Santa Clara purchases treated water, and with neighboring cities and water retailers.

The City of Santa Clara notified surrounding cities, the county, and the wholesaler water suppliers of its intention to modify the UWMP. A letter was sent to each of these entities notifying them of the opportunity to participate in the development process and the availability of the draft UWMP for comments. A copy of the letter is included in Appendix A.

Coordination during development of this 2005 UWMP occurred during a series of joint meetings and working sessions with representatives from the two wholesale water suppliers, neighboring cities and the Bay Area Water Supply and Conservation Agency (BAWSCA). The following cities and water retailers were involved in the coordination process: Milpitas, San Jose, Sunnyvale, Mountain View, San Jose Water Company and California Water Company. Meetings occurred on the following dates: June 16, 2005, July 28, 2005, and August 25, 2005. During these meetings there were extensive discussions of water demand projections and water supply availability.

A draft of this UWMP was provided to the two wholesale water suppliers, neighboring cities, and the Bay Area Water Supply and Conservation Agency (BAWSCA) for review and comments in August of 2005. Verbal comments were received from the Santa Clara Valley Water District on August 29 and October 11, 2005. Written comments were received from BAWSCA on August 31, 2005.

Table 1, Coordination with Appropriate Agencies

Coordination with Appropriate Agencies							
Agency	Participated in developing the plan	Commented on the draft	Attended public meetings	Was contacted for assistance	Was sent a copy of the draft	Was sent a notice of intent to adopt	Not involved
SCVWD	X	X		X	X	X	
SFWD	X			X	X	X	
BAWSCA	X	X		X	X	X	
Surrounding Cities				X	X	X	
San Jose Water Co				X	X	X	
California Water Co				X	X	X	

Public Participation

The City of Santa Clara has sought public input and comments in the preparation process for this UWMP. Drafts of the UWMP were made available for public review and comment at public libraries in the City of Santa Clara from October 10, 2005 until November 10, 2005. The City also publicized the revision of the UWMP and the opportunity to review drafts and make comments in an article in Inside Santa Clara, a newspaper distributed free of charge to all Santa Clara residents. A copy of the article is located in Appendix B. In addition, utility staff made presentations and received comments from the following:

City of Santa Clara Citizens Advisor Committee, August 22, 2005.

Santa Clara Chamber of Commerce, September 27, 2005.

The presentation at the meeting of the Citizens Advisory Committee was published in the Santa Clara Weekly in order to offer the general public an opportunity to participate in the development of this UWMP. A copy of the advertisement is also included in Appendix B.

Service Area Description

Geographic description

The City of Santa Clara Water Utility service area is outlined by the City limit boundaries of the City of Santa Clara. Santa Clara is located on the southern end of the San Francisco Bay, bounded on the north, east and south by San Jose, on the west by Sunnyvale, and on the southwest by Cupertino. Santa Clara occupies part of an alluvial plain, which stretches across the width of the south bay region. The City is approximately three miles wide by seven miles long. Ground elevations vary rather uniformly from near sea level at the north end of the City to 175 feet above sea level at the south end. The south San Francisco Bay area is has a high concentration of high technology industry, and is known as the "Silicon Valley."

The City of Santa Clara Water Utility distribution system consists of 327 miles of distribution mains, 7 storage tanks totaling 27.3 million gallons of storage capacity, 27 wells, and 3 booster pump stations.

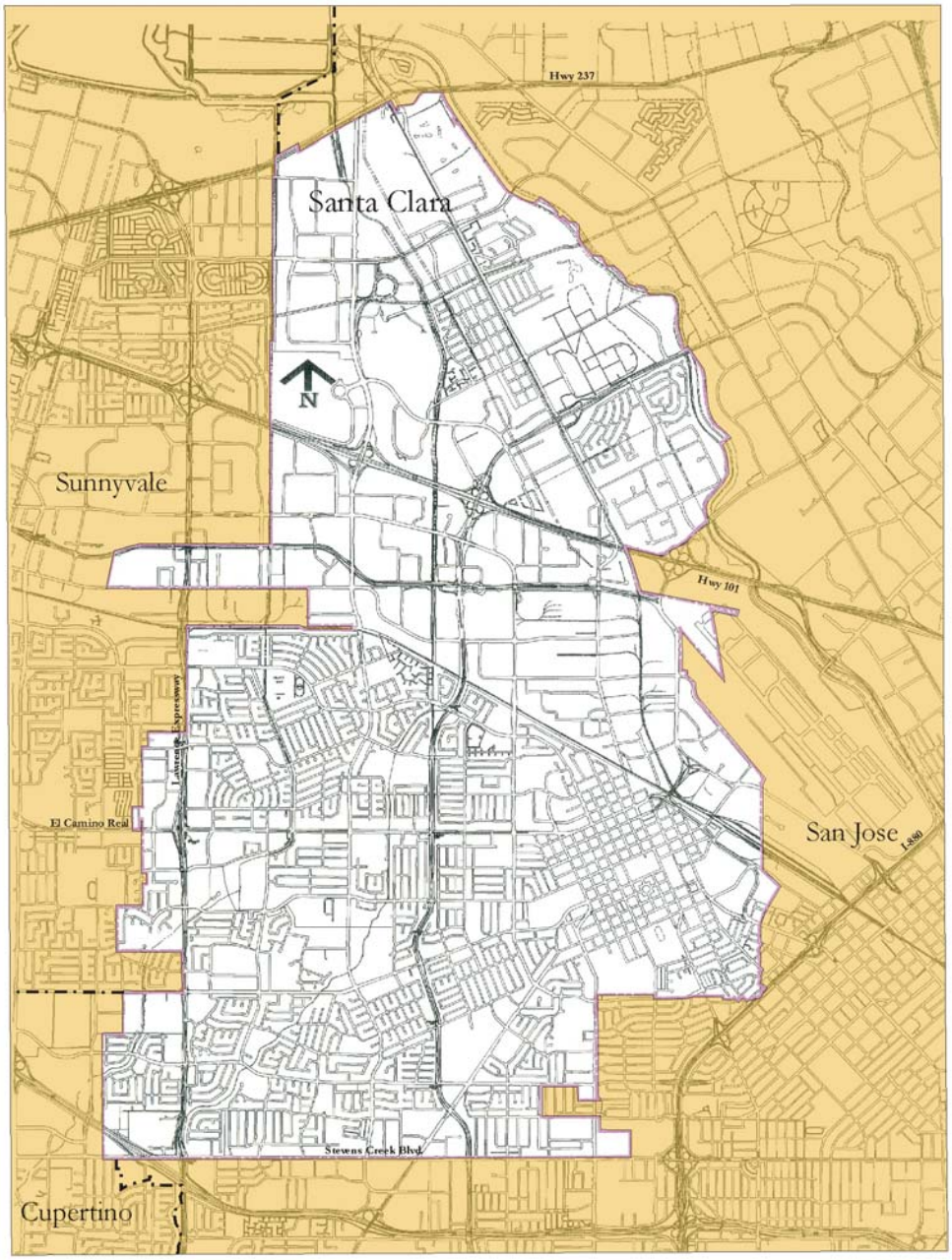

Figure 1, Geographic area

Land Use

The present area of the City is 12,352 acres or 19.30 square miles. About 37.5% of the land area is residential development including single-family homes, multi-family dwellings and apartments. While most of the residential area is in the southern part of the City, there are high-density home developments existing or under construction north of Highway 101.

Other major land use categories are commercial (6.8 %), industrial (22.5%), and public lands including roads and highways (31.4 %). Approximately 3.5% of the land area within Santa Clara is currently vacant. Several large tracts of land in the northern portion of the City have been zoned exclusively for light industrial use.

Although the City is essentially built out, a significant potential for redevelopment and on-site expansion remains. Some industrial facilities in the City have reserved land for future expansion on their current sites, and single story development has potential for conversion to higher density, multi-story development. Residential areas are currently approaching build out and further growth in this sector will most likely be high-density housing. The City's General Plan allows for mixed use (commercial and residential) along the commercial corridor of El Camino Real, which may add several hundred new residential units. Some infill projects and industrial conversion to residential may add a few hundred more.

Climate Characteristics

The climate in Santa Clara is semi-arid with warm and dry weather lasting from late spring through early fall. The average annual precipitation is 14.8 inches per year and the average monthly temperature is 58.3 degrees Fahrenheit (on line source, worldclimate.com). Detailed monthly data is listed in Tables 2, 3 and 4 below.

Table 2, Average Annual Precipitation[3]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Inches	3.0	2.5	2.4	1.1	0.4	0.1	0.0	0.0	0.3	0.7	1.5	2.7	14.8

Table 3, 24 hr Average Temperature by Month[4]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
C	9.0	10.9	12.2	13.8	15.9	18.1	19.5	19.4	18.7	16.2	12.4	9.3	14.6
F	48.2	51.6	54.0	56.8	60.6	64.6	67.1	66.9	65.7	61.2	54.3	48.7	58.3

Table 4, Standard Average ETO[5]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Inches	1.5	1.8	3.1	4.1	5.5	5.8	6.5	5.9	5.2	3.3	1.8	1.0	45.3

Demographic Factors

The City of Santa Clara is a diverse community. According to the 2000 Census[6], the racial make up of the City is 55.59% White, 29.27% Asian, 15.99% Hispanic or Latino, 2.29% African American, 0.53% Native American, 0.43%Pacific Islander, 6.94% other races and 4.95% from two or more races.

[3] Data derived from 1152 months between 1881 and 1976
[4] Data derived from 912 months between 1901 and 1976
[5] Historical Data, Extrapolated from 12 month Normal ETo Maps and U.C. Publication 21426
[6] http://en.wikipedia.org/wiki/Santa_Clara%2C_California, on line source accessed 8/5/2005

The 2000 median income for a household in the city was $69,466 and for a family of 4 is $77,189. The per capita income for the City was $31,755. The 2005 median family income (for a family of four) is $105,500. Approximately 7.8% of the population within the City is living below the poverty line.

There are 39,630 housing units within the City. 27.4% of households have children under the age of 18 living with them. The average household size is 2.58 and the average family size is 3.14.

The City of Santa Clara is like many suburban cities in the state of California. The population density is 5,566.2 people/sq. mile and the average housing unit density is 2,155.0 units / sq. mile.

Some of the demographic data listed above, such as family size and number of housing units, was used in the preparation of water demand projections.

Population Projections

In the past 25 years since 1980, the population of Santa Clara has grown from 87,746 to 109,376, an increase of 24.7%. Despite some of the highest rents and home prices in the nation, the Silicon Valley continues to attract new residents and is experiencing continuing increases in population[7]. Population growth is expected to continue during the next 20 years. In the next two years Santa Clara will see an immediate increase in population as several large residential developments are completed.

The end of 2004 saw the completion of much of the Rivermark Development on approximately 65 acres of property that had been a State Hospital. This development represents a significant increase in the number of residential units within the City. The Rivermark development consists of 1850 single-family dwellings and 1170 apartment units. All of the common area landscaping is served with recycled water. In addition, the development includes a 150-room hotel and an emergency housing shelter. Another infill parcel is 17 acres of State property located in the southern portion of the City. This parcel formerly housed the Bay Area Research and Extension Center (BAREC). The current project being planned for the BAREC site contains mixed single family (118 units) and multi-family (165 units of senior housing) residential development. Future residential developments will likely consist of redevelopment of lower density residential with higher density housing.

The historic and projected population for Santa Clara is shown in Figure 2 and Table 5.

[7] Silicon Valley Projections, Association of Bay Area Governments

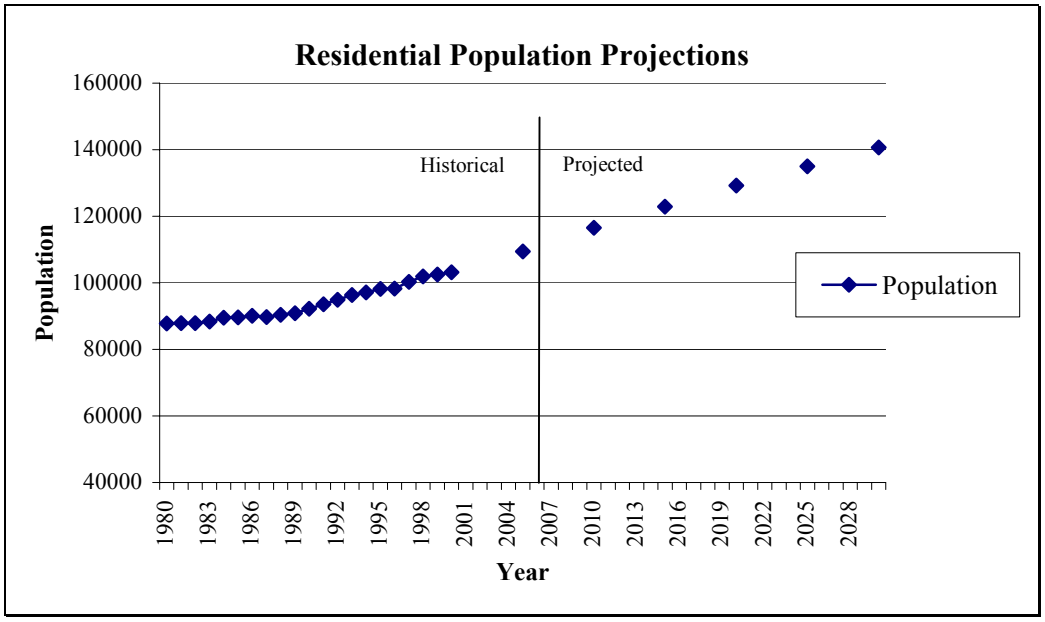

Figure 2, Residential Population Projections

Table 5, Actual and Projected Population

Actual and Projected Population						
2000	2005	2010	2015	2020	2025	2030
103,200	109,376	116,527	122,872	129,217	134,957	140,698

Water Supply

Water Supply Sources

The sources of water supply in Santa Clara are: groundwater, imported water from the SFWD Hetch-Hetchy system, imported treated water from the Santa Clara Valley Water District, and recycled water from South Bay Water Recycling. The Santa Clara water system is separated into four interconnected zones in order to provide optimum pressures throughout the City. In this manner the normal pressure ranges within the system are maintained between 50 psi and 92 psi; in any one area the pressures do not normally fluctuate more than 15 psi. A schematic diagram of the system is shown in Figure 3. A map of the zones within the City is shown in Figure 4.

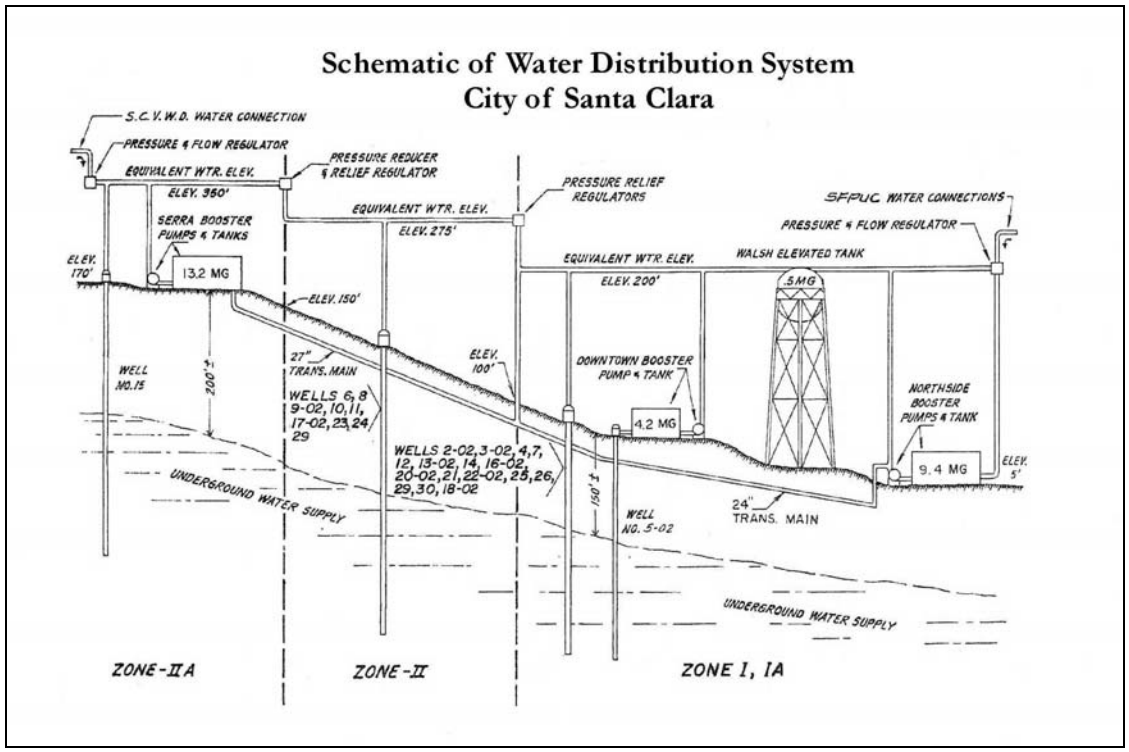

Figure 3, Distribution System Schematic

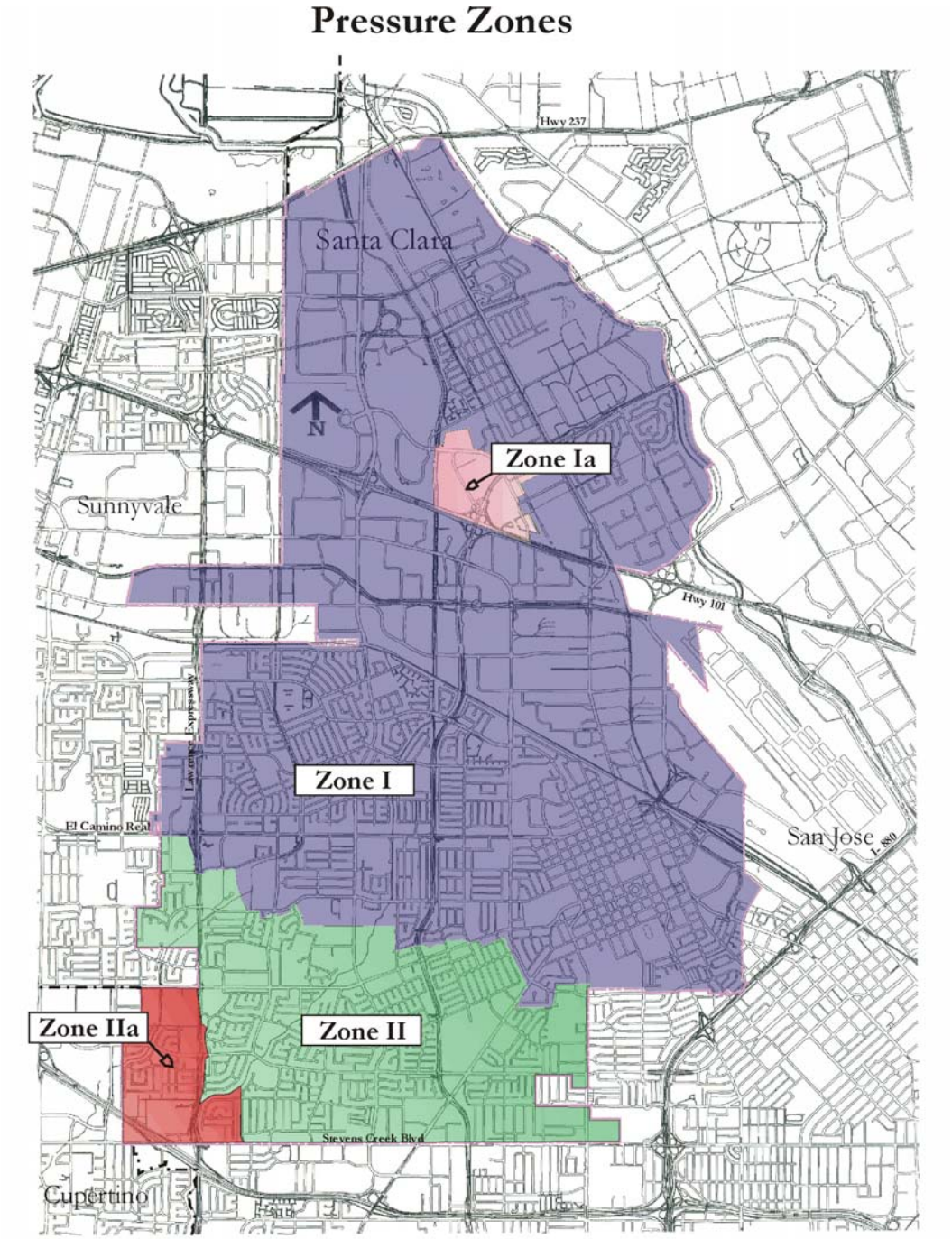

Figure 4, Pressure Zones

As seen in Figure 5, the predominant source of water within the City is groundwater from wells that are owned and operated by the City. Various areas within the City receive water from one or more sources depending on location. Figure 5 shows the approximate boundaries of the various sources. One section of the northwest portion of the City (designated Zone 1a) is designed to receive water

solely from San Francisco Water's Hetch-Hetchy system. This area of the City has no well for groundwater supply; with the adjacent area north of Bayshore Freeway currently having only one operational well and one existing inactive well. Two new wells are under construction and/or are being studied for wellhead treatment for manganese.

The southern portion of the City receives a blend of water from City wells and treated water from the District. The blend of water in this area is approximately 60% well water and 40% treated surface water. The boundaries indicated on Figure 5 are approximate. The zones of influence from the various water sources are dynamic and will change depending on changes in supply and the overall demands on the system.

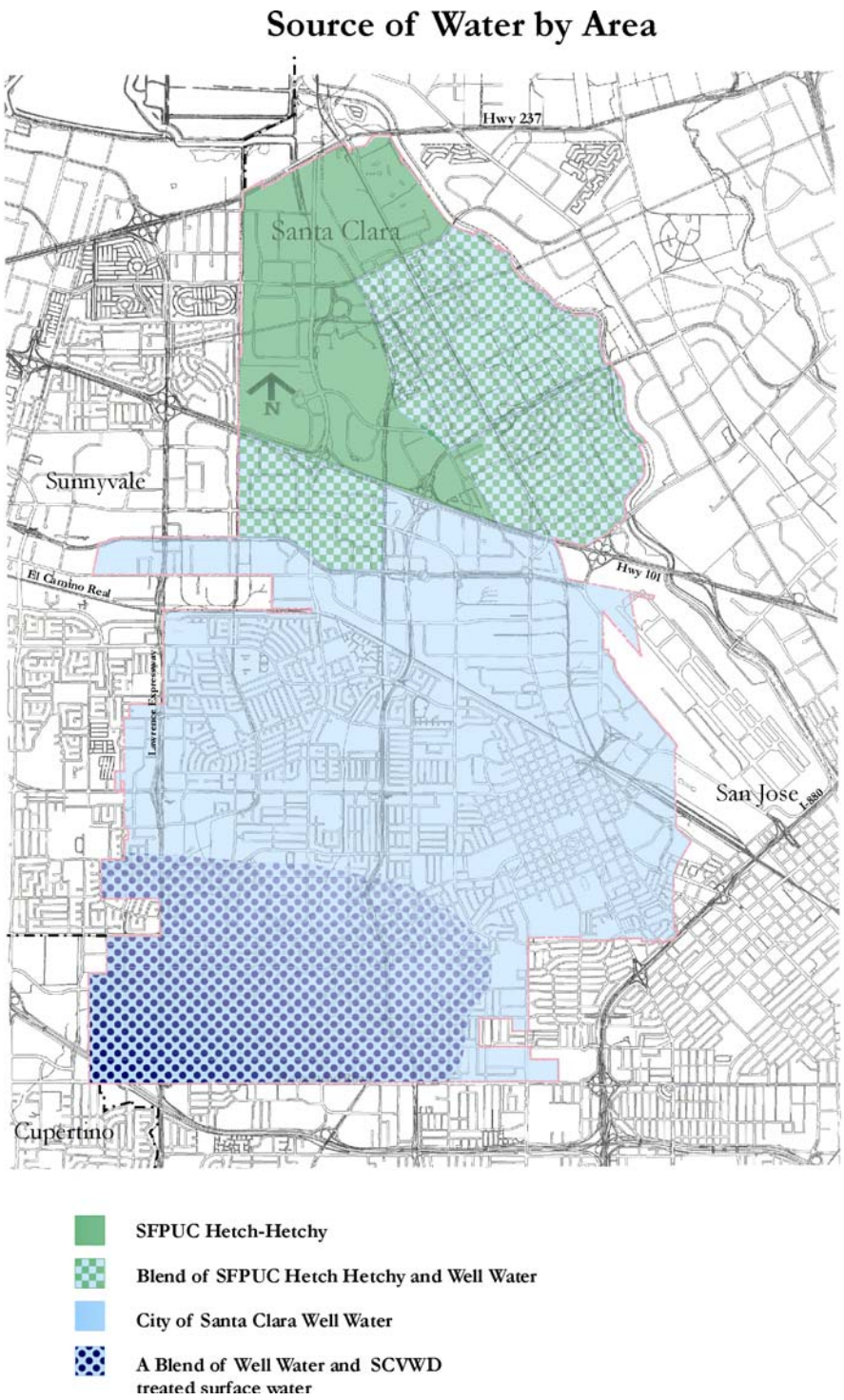

Figure 5, Water Source by Area

Groundwater

The local groundwater basin currently provides about two thirds of the City's potable water supply. It is the primary source of water for domestic, industrial, and agricultural use in the City since the area was first settled. This aquifer acts as a large underground reservoir that the City's 27 wells use as a water source.

The Santa Clara Valley groundwater basin extends from the Coyote Narrows at Metcalf Road in San Jose to Santa Clara County's northern boundary. It is bounded on the west by the Santa Cruz Mountains and on the east by the Diablo Range: these two mountain ranges converge at the Coyote Narrows to form the southern limit of the sub basin. The sub-basin is 22 miles long and 15 miles wide at its widest point, with a surface area of 225 square miles. The southern area is an unconfined zone, or "forebay", where confining clay layers do not extend. Santa Clara Valley Water District staff estimates the operational storage capacity of the sub-basin to be 350,000 acre-feet with an estimated limit of 200,000 acre-feet maximum withdrawal in any one year. The Santa Clara Valley groundwater basin is shown in Figure 6 (225 square miles, 144,000 acres) and is the largest of three interconnected groundwater basins occupying a total of 240,000 acres of the 849,000 acres in Santa Clara County.

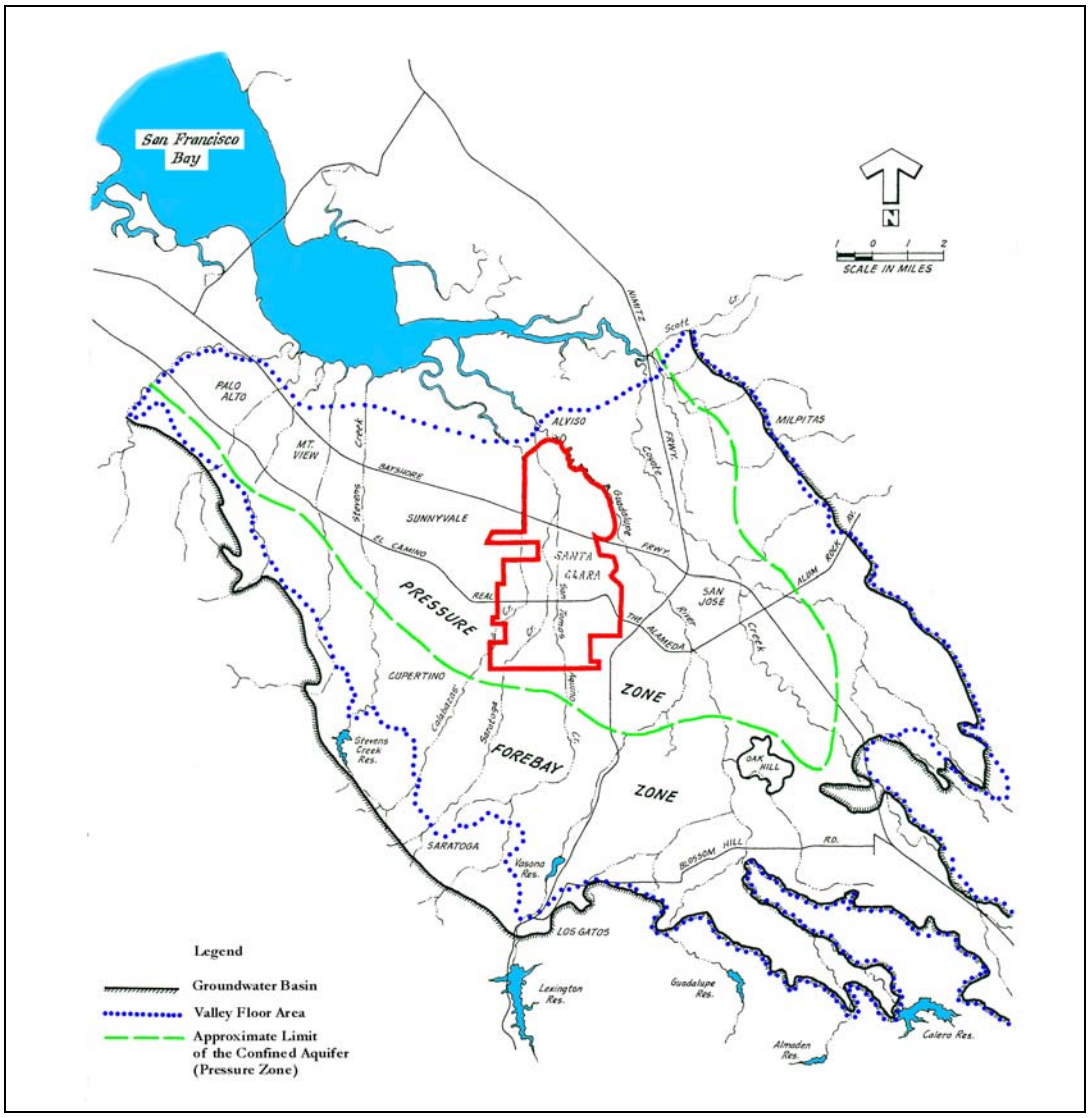

Figure 6, Map of Groundwater Basin

The Santa Clara Valley groundwater basin is not adjudicated. The allowable withdrawal or safe yield of groundwater by the City of Santa Clara is dependent upon a number of factors including: withdrawals by other water agencies, quantity of water recharged and the carry over storage from the previous year. Development and agricultural needs in the 1920s increased the demand on the water systems within the Santa Clara Valley. This increased extraction of groundwater led to subsidence in several of the aquifers. The Santa Clara Valley Water Conservation District (currently Santa Clara Valley Water District) was originally formed in 1929 to alleviate land surface subsidence in and around San Jose through artificial recharge of the groundwater. The rapid development of Santa Clara County occurred again in the 1960s and the corresponding increased demand on the existing water supply again resulted in the over-drafting of the groundwater basin. The continued over-drafting of the basin resulted in a significant lowering of the groundwater table, significant subsidence of the land in the northern portion of the valley and compaction of several aquifers. When an aquifer is compacted the storage capacity of the aquifer can be substantially reduced. Once lost, storage capacity cannot be regained.

In order to avoid any further subsidence and loss of aquifer capacity the District has attempted to operate the basin to maintain or increase groundwater storage through managed recharge with local supplies augmented with imported raw water. In the late 1960s/ early 1970s the District's conjunctive management of surface water and groundwater effectively halted the over-drafting and resulting subsidence. The District is currently using projected supply, carryover capacity and anticipated demand to predict potential water shortages. The July 2001 Santa Clara Valley Water District *Groundwater Management Plan* describes the groundwater recharge program in detail. This *Groundwater Management Plan*, the most recent formally adopted plan, is included in Appendix C. The Santa Clara Valley Water District is currently working to revise its *Groundwater Management Plan*. The updated Plan is anticipated in 2006 and so will not be finalized before this UWMP is completed.

In April of each year, when the quantity of imported water available to the District by contract and the local water yield can be estimated fairly accurately, the District estimates the carryover storage. Based on the calculated carryover capacity and the anticipated customer demands, the District reviews and modifies its groundwater management strategy in order to maintain adequate water in the basin to avoid subsidence[8].

The City's wells are strategically distributed around the City. This distribution of wells adds to the reliability of the water system and minimizes the possibility of localized subsidence due to localized over-drafting. Appendix D shows the production for individual wells and the depth to water for Fiscal Years 2000/01 to 2004/05. Appendix D also shows the pressure zone in the distribution system within which the well is located. Minor seasonal fluctuations in the depth to water are seen in the table but there is no evidence of declining water table or over-drafting, in fact the depth to water has been rising over the past 10 years. The pressure zone designation gives an approximate geographic distribution for the wells. The exact location of the wells is not included in this UWMP for security reasons.

Table 6, Annual Groundwater Pumped in AF/Y

Annual Groundwater Pumping in AF					
	2000	2001	2002	2003	2004
Historic groundwater pumping (AF)	18,463	17,223	15,921	15,354	15,943
% of Total Water Supply	64.3%	62.9%	60.5%	59.6%	59.6%

Table 7, Annual Groundwater Projected to be Pumped in AF/Y

Amount of Groundwater Projected to be Pumped - AF					
	2010	2015	2020	2025	2030
Projected groundwater (AF)	16,298	17,257	18,346	19,340	20,387
% of Total Water Supply	51.4 %	52.3 %	53.7 %	55.0 %	56.2 %

[8] Santa Clara Valley Water District, Draft Urban Water Management Plan, August 2005

In FY 2004/05 a total of 14,629 acre-feet (4,766.4 MG) were pumped from the 27 production wells within Santa Clara. Groundwater from wells accounted for 59.6% of all water used in Santa Clara (including recycled water) and 62.5% of the total potable water supply.

Treated Surface Water From Santa Clara Valley Water District

The City of Santa Clara receives treated surface water from the District's Rinconada Water Treatment Plant via the Santa Clara "distributary" (pipeline) at the Serra Tank site at the southwest corner of the City. The City currently takes about 2500 to 2700 gpm from this supply and could construct an additional turnout to add more imported District water to our water supply. There is a limit to this: if the City were to utilize more than approximately 4,000 gpm total flow rate (5.76 MGD, average) the pressure loss through the District's pipeline from this flow (along with that of other users from the pipeline) could require some or all of the following:

1. Re-pumping (re-pressurizing) the water,
2. Modification of the City storage and transmission system,
3. The other users would also need to re-pump District water at their connection sites to meet their system pressures.

A modification of the current District connection, or a separate connection would allow for greater flows than the current 4,000 GPM flow limit. The City is investigating a new connection to allow for the District's treated water to enter the City's system at a new location: this would allow increased capacity to take this treated water and greater flexibility of operations. Significant increase in the City's use of District treated water would probably require an expansion of the District's Rinconada Water Treatment Plant, which is currently under design by the District.

In FY 2004-05 Santa Clara Valley Water District treated water was the source of 4,049 acre-feet (1,319.3 MG) or 17.3% of the total potable water supply.

Treated Surface Water From San Francisco Water Department

The San Francisco Water Department water supply system was planned during the late 1800s and constructed in the early 1900s. The first water was delivered to the Bay Area from the Hetch-Hetchy system in 1934. The San Francisco Public Utilities Commission is a department of the City and County of San Francisco that provides water, wastewater services, and municipal power to the City of San Francisco. Under a contractual agreement, 28 wholesale water agencies in Alameda, San Mateo, and Santa Clara counties purchase water supplies from the SFPUC. These 28 wholesale customers, including the City of Santa Clara, comprise the Bay Area Water Supply and Conservation Agency (BAWSCA). BAWSCA was created on May 27, 2003 to represent the interests of 26 cities and water districts, and two private utilities that purchase water on a wholesale basis from San Francisco. BAWSCA is the only entity having the authority to directly represent the needs of these entities that depend upon the San Francisco regional water system.

The San Francisco Water Department obtains its water from the Tuolumne River watershed in the Sierra Nevada Mountains, Calaveras and San Antonio Reservoirs in Alameda and Santa Clara Counties, and from Crystal Springs Reservoir on the San Francisco Peninsula. The various water sources utilized by San Francisco, water delivered direct from the Sierras along with local supplies from Calaveras and San Antonio Reservoirs, are delivered to San Francisco bay area through the Hetch-Hetchy Aqueduct. A branch of the aqueduct traverses the northern portion of the City of Santa Clara. This branch of the Hetch-Hetchy system is called the Bay Division Pipelines and consists of two pipelines (96" and 72") under high pressure. Within Santa Clara County, the Cities of Milpitas, San Jose, Sunnyvale, Palo Alto, Mountain View, Los Altos and Los Altos Hills obtain some or all of their water from the Hetch-Hetchy system.

The City of Santa Clara has two connections to the Hetch-Hetchy system to receive water from SFWD. The combined capacity of these two turnouts is 7500 gpm or 10.8 MGD, although current contractual arrangements limit the City's use to less than 6.57 MGD maximum rate. The City's current understanding with San Francisco is that this source is to only supply that portion of the City of Santa Clara north of Bayshore (US Highway 101); the City's current expected average for this use is 5,500 Acre-feet per year, or 4.9 MGD annual average. This capacity can be obtained without additional pumping costs. Water can also be taken into the Northside Storage tanks for re-pumping into the water distribution system. The area served by Hetch-Hetchy is primarily industrial, with several key industries in Santa Clara being supplied water that is predominately from the Hetch-Hetchy system.

Currently the City of Santa Clara has an interruptible supply contract with San Francisco. San Francisco has been unwilling to grant Santa Clara a permanent contract because the current firm delivery capability of the Hetch Hetchy system is fully committed, and in some cases over-committed through San Francisco's current wholesale contracts. Instead of amending the existing contractual agreements with San Francisco, the 28 agencies of BAWUA (now BAWSCA) adopted a multi-lateral agreement titled the *Interim Water Shortage Allocation Plan*. The *Interim Water Shortage Allocation Plan* has the effect of providing a formula for an assured supply of SFPUC water in times of a water shortage. This, in effect, makes the Santa Clara supply of SFPUC water non-interruptible with a formula for allocation in times of shortage. All contracts for water service from San Francisco are to be re-negotiated by 2009 (the term of the current contract). During FY 2004-05 SFPUC Hetch-Hetchy system was the source of 4,734 acre-feet (1,542.4 MG) or 20.2% of the potable water supplied to Santa Clara. Depending on the outcome of contract negotiations and the eventual price deferential between SFWD supply and District treated water supply, the long-term projections of 5,500 AF/year of water supply from SF PUC may be reduced or eliminated.

Recycled Water

Recycled water within the City of Santa Clara is supplied from the jointly owned San Jose- Santa Clara Water Pollution Control Plant (WPCP). This recycled water meets California Administrative Code (CAC) Title 22 Division 4 requirements for "unrestricted use". The City and all users of recycled water must insure that a number of regulatory requirements specified in CAC Title 22 are met. CAC Title 22 specifies the types of use and the conditions under which the use of recycled water is allowed.

The South Bay Water Recycling Program was initiated to reduce the discharge of treated water flowing from the WPCP into the San Francisco Bay. A past WPCP discharge permit placed a discharge limit of 120 million gallons each day during the summer ("dry-weather flow") to help maintain the salt marsh habitat of the south Bay. As a result, the WPCP formed South Bay Water Recycling (SBWR), which purchased the City of Santa Clara's recycled water system and now is the regional recycled water wholesaler within the WPCP service area. SBWR provides oversight, promotes recycled water, operates the recycled water distribution system, and assists recycled water customers both technically and financially. The second driving force behind the water recycling efforts was changes in the State of California Water Code. In 1991, the state passed the Water Recycling Act of 1991, which is contained in Sections 13575-13583 of the California Water Code. The Water Recycling Act instructs water retailers to "identify potential uses for recycled water within their service areas, potential customers for recycled water service within their service area, and, within a reasonable time, potential sources of recycled water."[9] Within certain technical and financial considerations, water retailers are instructed by the Water Recycling Act to provide recycled water to customers that request it. To further encourage the use of recycled water, the

[9] California Water Code Section 13579(a)

Water Code was also changed to prohibit the use of potable water for certain uses, if recycled water is available.[10] The City's Rules and Regulations include this prohibition.

City Use of Recycled Water

Recycled water is primarily used for irrigation of large turf areas within the City such as golf courses, parks, and schools. Several industries use recycled water in industrial processes, cooling towers or for toilet flushing in dual plumbed buildings. The City's electric utility is operating a 147 MW power plant that uses recycled water exclusively for cooling water and steam for power production. Still, the predominant use remains irrigation.

SBWR provided funding for 19 miles of recycled water distribution mains as the first phase of construction. Two additional projects are currently scheduled in the City for a continuation of the second phase of construction as funded by SBWR. The recycled water system is owned by the WPCP under the SBWR program. The City maintains the system under contract by agreement with the City of San Jose. Additional in-fill projects of smaller distribution lines should continue over the next 10 years once the several Phase 2 extensions are completed. In FY 2004-05 recycled water was the source of 2,480 acre-feet (807.9 MG) of the water supplied to Santa Clara. In FY2004-05 the combined volumes of potable water from Santa Clara Wells, Hetch Hetchy, and the District was 23,412 acre-feet; recycled water represents 9.6% of the water used within the City. The City's 2002 Master Plan had estimated that the total annual use of recycled water in Santa Clara could reach 2,000 acre-feet per year (652 MG) by 2010. In the last three years, recycled water usage has grown significantly faster than even those ambitious projections.

Existing Supply Volumes

Historically the predominant source of water used to meet water demand in the City of Santa Clara has been groundwater. In fiscal year 2004/05 groundwater represented 56.5 % of total water sales. Over the last 15 years, the amount of recycled water used within the City has risen dramatically. As shown in Figure 7 below, in fiscal year 04/05 recycled water represented 9.6% of total water sales. Imported water, water from Hetch Hetchy and the SCVWD, represented 33.9% of the total water sales during this period.

[10] California Water Code Section 13550-13551

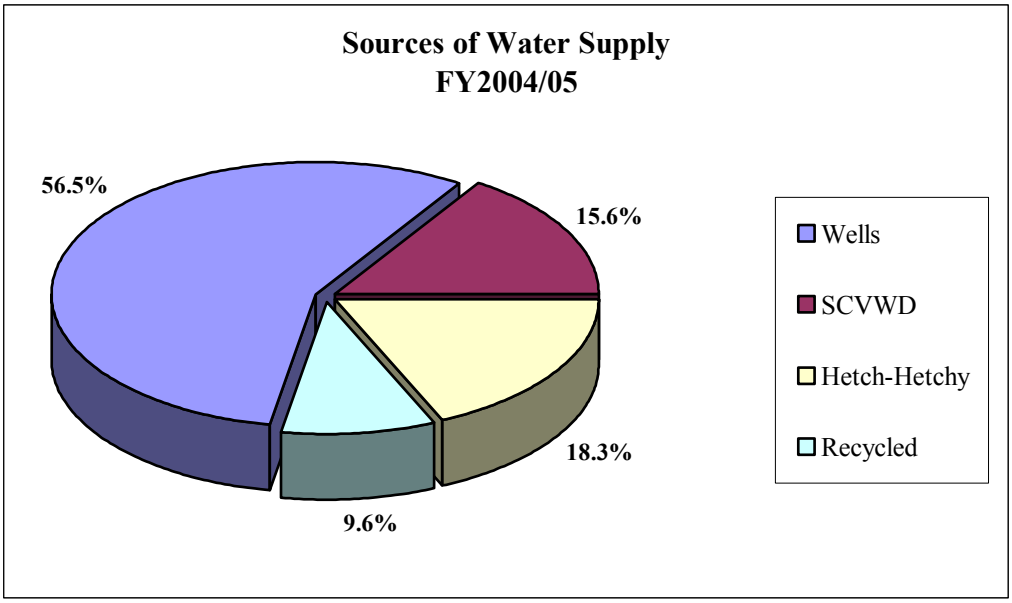

Figure 7, Sources of Water Supply, FY2004/05

Efforts to Minimize Imported Water and Maximize Resources

The City of Santa Clara has adopted several management strategies to minimize imported water use and maximize local resources. The use of recycled water to offset water demand resulting from growth is one of the key management strategies used by the City of Santa Clara to reduce the reliance on imported water. Also, SCVWD states in their UWMP as well as in their Integrated Water Resource Plan that the SCVWD manages their system to maximize the use of local supplies. This in turn reduces the reliance of the City on imported sources.

Recycled water has provided the City a drought proof water supply for customers who have acceptable uses. Recycled water has been used to offset growth in the potable water demand. The recently constructed Don Von Raesfeld Power Plant is the single largest recycled water user in Santa Clara. If the DVR Power Plant had not been supplied with recycled water, the City's potable demand would have increase by 1.5 MGD or approximately 7% when the DVR is at full production. Recycled water is also being used in the Rivermark development. Rivermark is the single largest development (mixed residential and commercial) in Santa Clara's history. Common areas, median strips, parks, commercial landscaping and residential front yards are all irrigated with recycled water. Recycled water has a secondary benefit of reducing the potable demand during the high demand summer months. This reduction in the overall demand reduces dependence on imported water sources and groundwater (and provides greater reliability from the existing potable storage volumes). Recycled water accounted for 9.6% of the total water delivered in FY 2004/05 or equivalent to the approximately half the volume of water supplied by either Hetch Hetchy or the District's treated water.

The City's use of imported treated water at a relatively constant rate per our contracts allows for a controlled and predictable use of imported water. The City's use of ground water to meet the variable demand (diurnal and seasonal) utilizes local supplies to the maximum extent practicable, although some imported water is used by the SCVWD to augment local supplies for groundwater recharge.

The District provides all the management of local resources and contracts for imported water other than the Hetch Hetchy supply. While the District manages the county's water supplies to maximize the use of local supplies, it is imperative to augment local supplies so that the local supplies (mostly recharged to the groundwater basin) are not over used. See section on groundwater basin management for more details.

Exchange and Transfer Opportunities

The City of Santa Clara does not have the ability to directly contract for water transfers from outside the county. Seven interties exist for emergency transfers with neighboring agencies (City of Sunnyvale. San Jose Municipal Water, San Jose Water Company and Cal-Water). These five automatic and two manual connections are intended only for water supply emergencies and are not intended for long-term water transfers.

During times of drought and subsequent reduced water supply, the Interim Water Shortage Allocation Plan (IWSAP) developed by BAWSCA and ratified by SFPUC, and each of its wholesale contractors allows for voluntary water shortage allocations for SFPUC wholesale customer agencies. Also, water "banked" by a SFWD wholesale customer, through reductions in usage greater than required for a given shortage, may be transferred between agencies.

The IWSAP will expire in June 2009 unless extended by San Francisco and the wholesale customers. The projected amount of water that the City of Santa Clara expects to receive from SFPUC during dry years after 2010 has been calculated by SFPUC on the assumption that the Plan will in fact be extended or incorporated in a new Master Contract.

Water Use

Past and Current Water Use by Sector

For purposes of water use tracking and long range planning, the City's water accounts are categorized into six broad categories of users: single-family, multi-family, industrial, commercial, institutional and municipal. Landscape irrigation is not broken out as a separate category. Although separate landscape irrigation meters do exist within the City, these accounts are coded the same as the general account for each facility. Therefore water delivered through an irrigation meter at a manufacturing facility is included as usage within that industrial category. A more detailed discussion of landscape demand appears under the section below entitled Landscape Irrigation.

Figure 8 shows the historic water demands by each user category. In examining the historical usage by user category several facts become apparent. During the drought years of 1986-92 water demand was reduced in all categories as a result of demand management measures put in place in response to the drought. The second fact that is apparent is the lack of linkage between sectors when a drought is not influencing overall water demand. After the 1986-92 drought all sectors increased their water demand however the industrial sector has shown a decreasing demand, mainly due to changes in the electronic industry over the past eight years, while the commercial sector has shown a steadily increasing water demand. Multi-family water demand has remained relatively flat over the last ten years but single family residential has shown an increase since the drought but a downturn in demand over the last 6 years.

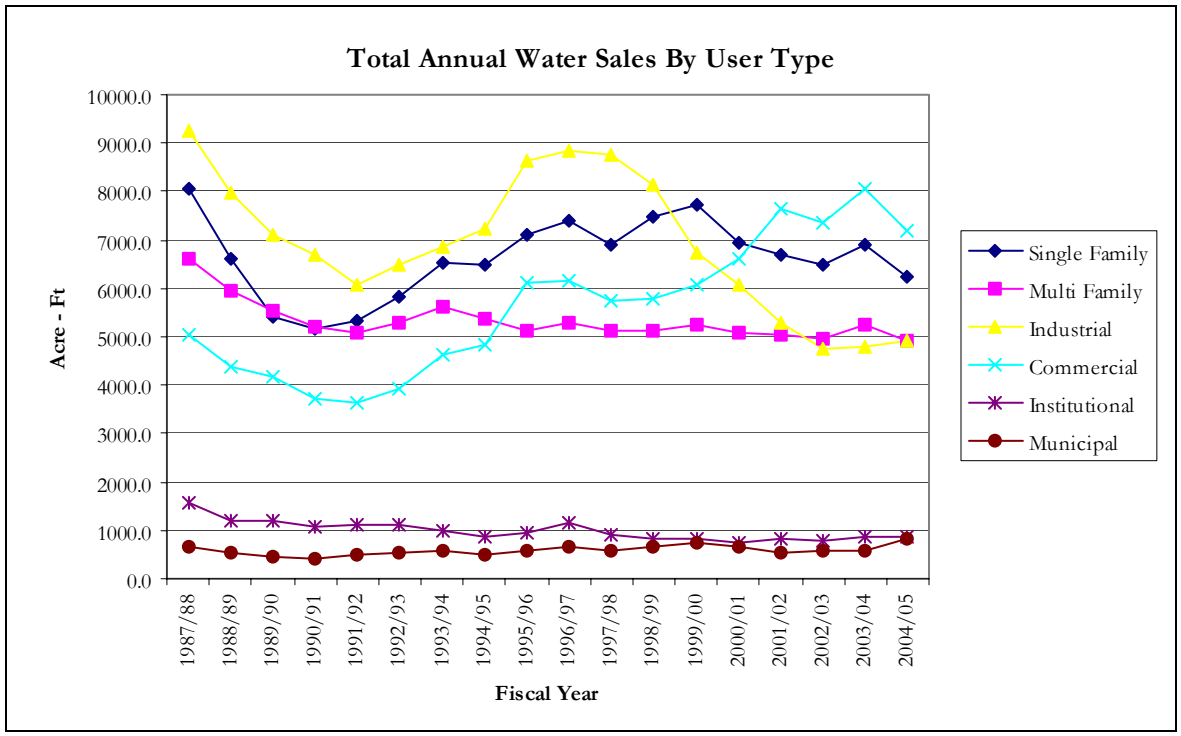

Figure 8, Total Annual Water Sales by User Type

Water use is inherently variable. Water usage is dependent on a number of factors including weather, season, day, hour, customer category and, for certain industries, business climate and the economy. For example FY 2004/05 shows a decrease in water usage over previous year. A number of rainstorms in April, May, and June resulted in far less water being used for irrigation compared to the previous year that was warmer and drier.

Some general patterns are obvious such as irrigation usage increases during summer months. Long-term general trends in overall usage are valuable in projecting future supply requirements for categories of users.

Determining the patterns of usage and peak demands is critical for long term water supply planning. Peak demand factors are also critical in calculating the distribution system's capability of meeting the peak hour, peak day and peak month demands. However, this UWMP only examines the City's ability to meet average annual demands.

Figure 9 shows the total sales by user classification for the 2004/05 fiscal year. Water sales are evenly divided between residential and industrial/commercial sales with Municipal and Institutional sales accounting for a minor portion of the water sold. The City has a diverse industrial base with many customers that are dependent on water as a part of their manufacturing processes.

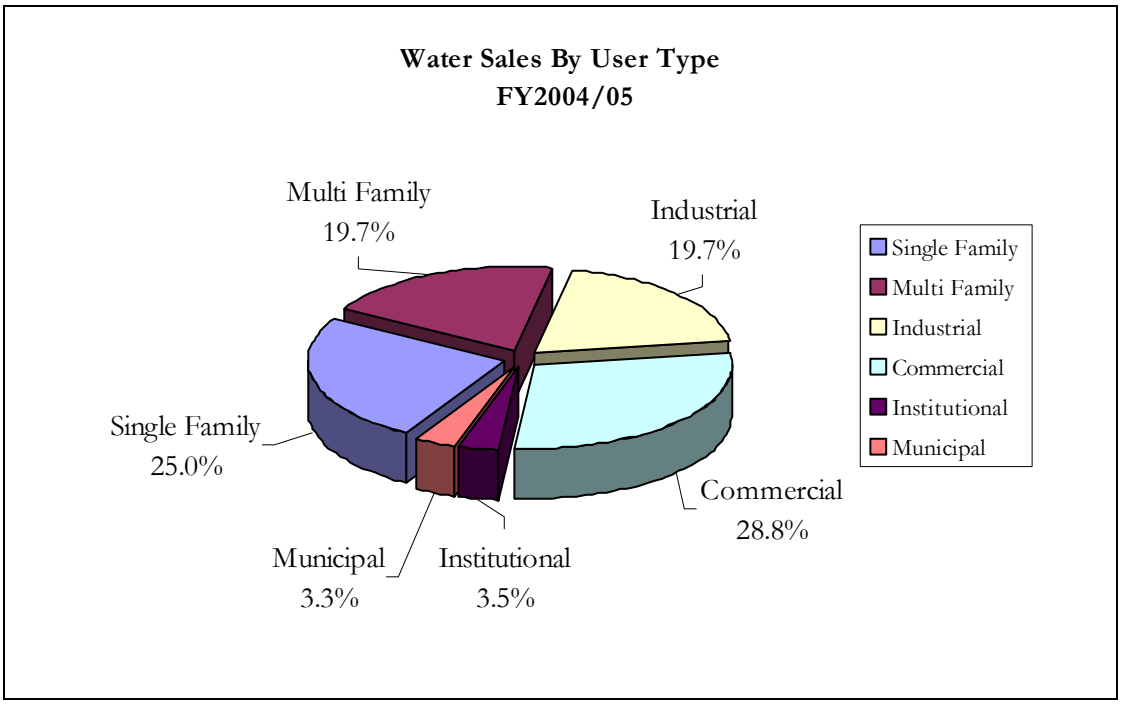

Figure 9, Water Sales by User Type FY 2004/05

Water Demand by User Category

One of the goals of this Plan is to forecast the future water demand in order to determine the capability of the water supply to meet projected future needs. In order to project future water demand a model or methodology must be selected. In the City's 2002 Water Master Plan, water demand projections were prepared for each user category. Several different forecasting methods were used. The method selected for each user category is based on the following: 1) the type and quality of the data available, 2) the existence of a dependent variable that could be identified on which a projection could be based; and, 3) the statistical significance of identifiable trends. An explanation of the particular method used for a user category was contained in the corresponding section of the Water Master Plan.

Since the 2002 Water Master Plan was prepared, the City of Santa Clara has suffered the continuing effects of an economic downturn that is reflected in the water sales for the industrial sector. There are indications that this economic downturn has bottomed out and that industries will resume moderate growth. Although the methodology used in the previous Water Master Plan was a generally accepted methodology, the City choose a different method for projecting water demand for this UWMP. It should be noted that both methodologies have comparable results in overall water demand to within $\pm$3%.

The water demand projections for this Urban Water Management Plan were developed as part of a series of technical studies performed in support of the Capital Improvement Program for the SFPUC Regional Water System: These technical studies include *SFPUC Wholesale Customer Water Demand Projections* (URS 2004); *SFPUC Wholesale Customer Water Conservation Potential* (URS 2004); *SFPUC Wholesale Customer Recycled Water Potential* (RMC 2004); and *SFPUC 2030 Purchase Estimates* (URS 2004).

Water demand projections were developed using an "End Use" model. Two main steps are involved in developing an End Use model: 1) Establishing base-year water demand at the end-use level (such as toilets, showers) and calibrating the model to initial conditions; and, 2) Forecasting future water demand based on future demands of existing water service accounts and future growth in the number of water service accounts.

Establishing the base-year water demand at the end-use level is accomplished by breaking down total historical water use for each type of water service account (single family, multifamily, commercial, irrigation, etc.) to specific end uses (such as toilets, faucets, showers, and irrigation).

Forecasting future water demand is accomplished by determining the growth in the number of water service accounts. Once these rates of change were determined, they were input into the model and applied to those accounts and their end water uses. The DSS model also incorporates the effects of the plumbing and appliance codes on fixtures and appliances including toilets (1.6 gal/flush), showerheads (2.5 gal/minute), and washing machines (lower water use) on existing and future accounts.

The basic methodology of the model is to break down water usage into an average consumption per account type. Projections are made regarding potential reductions in average consumption based on water conservation programs, and natural replacement of less water efficient processes with more efficient processes. These projections are used to adjust the future average consumption per account figures. Projections of the future number of accounts for each user type of the future number of accounts are also calculated, typically based on other technical studies such as Association of Bay Area Governments (ABAG) Projections or Census data. The projected number of accounts is based on the projected number of housing units for residential or the projected number of jobs in the case of the industrial and commercial categories. Job projections were taken from the ABAG publication, Silicon Valley Projections. Once both the number of accounts and the average consumption per account are calculated, the number of account for each future year is multiplied by the average consumption per account for that year to arrive at a total water demand for each user type.

Residential

The water usage data for single and multi-family dwellings can be reduced to a per capita value by dividing the total residential water sales by the population of the City for that year. The per capita residential water usage has decreased over the past 15 years due to water conservation and water efficiency standards for devices such as ultra-low flush toilets and low-flow showerheads. During the 15 year period between FY 1989/90 and 2004/05 the per capita residential water use appeared to have stabilized at 105 gallons/person/day with a standard deviation of 7 gallons/person/day (Figure 10). The per capita usage reached a low of 91 gallons/person/day in FY2004/05. However, FY 2004/05 had an unusually wet and cool spring that significantly reduced irrigation during the period from March to June, which contributed to the noted low per capita water usage for this fiscal year.

Single family and multi-family residential were separated in the projections for the residential sector. Demographic information from census data and population projections from ABAG Silicon Valley Projections were used in conjunction with the End Use Model to calculate future residential water demand.

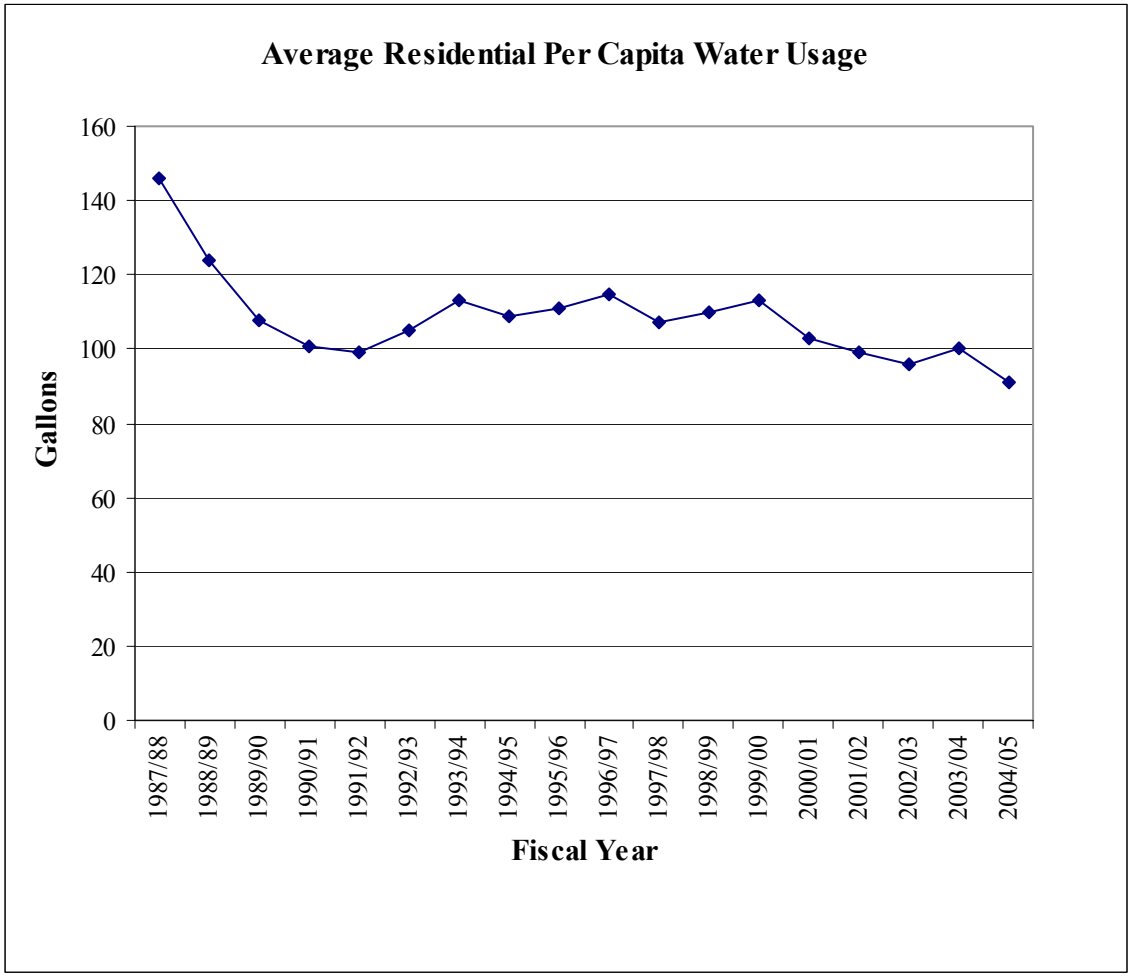

Figure 10, Average Residential per Capita Water Usage

Industrial

The industrial sector, for purposes of this UWMP, consists of food manufacturers and processors, paper product manufacturers, industrial chemical manufacturers, metal finishing facilities, machinery manufacturers, electronics industry and measuring equipment manufacturers. The predominant industry within the City of Santa Clara is electronics manufacturing.

As can be seen in the graph in Figure 10, the water sales for the industrial sector has dramatically decreased since FY 1997/98. This decrease in water sales to the industrial sector is due in part to the economic downturn experienced by the Silicon Valley region.

The economic downturn over the last few years had led to a loss of jobs in the area. Some of these job losses are temporary and some are permanent. The economic downturn is estimated to have resulted in the loss of 140,000 jobs in the region with an unspecified number of those job losses being in Santa Clara[11]. ABAG projections show some job sectors decreased from 2000 to 2005 and

[11] Association of Bay Area Governments, Projections 05

are not expected to recover to 2000 levels until 2010. According to ABAG projections, Santa Clara County's economy is expected to become more stable and show slow job growth from 2005 to 2015 with more significant job growth between 2015 and 2030.

Preparing projections of future water demand for the industrial category is problematic because a small number of large volume water users have a significant effect on the overall usage data. The water usage within this category is related most significantly to production levels within the electronics industry, which represents 80% of the water usage within the industrial category and 15% of the total water demand within the City, based on water sales for FY2004/05.

Commercial

The Commercial sector is comprised of all non-residential accounts that are also not classified as municipal, institutional, or industrial. The types of facilities that are included in this category are hotels, automotive repair, gas stations, automotive dealerships, retail stores and restaurants.

A decrease in water demand for this category was noted in the late 1980s, which corresponds to conservation measures implemented in response to the 1986-92 drought period. Usage within this category has increased since 1992. The End Use Model projects that usage within this category will continue to increase based on a projected increase in the number of jobs within this category. The projected increase in the number of jobs is based on projections made by the ABAG report, Silicon Valley Projections.

Institutional

The institutional base consists of the colleges and hospitals within the City. This category is relatively stable compared to other categories such as the commercial sector where a certain degree of business turn over is expected.

Municipal

This category includes City, county, and state buildings that are located in the City of Santa Clara, as well as parks, median strips and school district facilities. Municipal water use has remained relatively constant over the past 14 years. This category is typified by large green space, such as parks and school play fields. This is evident from the percentage of water demand that is attributable to external use. Additions (new accounts) to the municipal category have been offset by use of recycled water for landscape irrigation.

Landscape Irrigation

As noted earlier in this UWMP, landscape irrigation is not broken out as a separate category. The City of Santa Clara has 417 dedicated landscape meters but the usage through these meters is categorized the same as the main water meter for their related facility. During the course of preparing the water demand projections, the average amount of irrigation per category type was calculated based on a comparisons between summer and winter water usage. The calculated percentages of outside usage are shown in Table 8.

Table 8, External vs. Internal Water Use by Category

Category	Percent Internal Water Use	Percent External Water Use
Single Family	58.39%	41.61%
Multi Family	77.11%	22.89%
Industrial	84.46%	15.54%
Commercial	74.52%	25.48%
Institutional	48.68%	51.32%
Municipal	26.81%	73.19%

System Losses

Water loss within the distribution system can occur due to leaks, breaks, malfunctioning valves, fire suppression and the difference between the actual and measured quantities from water meter inaccuracies. A certain amount of loss is anticipated and considered normal. Some water losses are actually legitimate unmetered uses such as for mainline flushing, tests of fire suppression systems and street cleaning. Figure 11 shows the distribution system losses as a percentage of total sales over the last eight fiscal years.

The losses experienced by the Santa Clara water distribution system are substantially lower than the 10% losses normally experienced by systems in urban areas[12]. 95 percent of public water distribution systems experience losses between 7% and 15%. The City's low percentage of unaccounted for water is not typical and resulted in one area of deviation from the End Use Model prepared by Maddaus Water Management. The End Use Model prepared by Maddaus Water Management assumed future system loses of 7%. The system loss projections and total demand projection contained in this UWMP assume a future system loss percentage of 3%, which is closer to the actual system loses historically experienced by the Utility. During the past 11 years, losses within the Santa Clara water distribution system have been below 4% and are projected to be 3%, or less, per year in the future. For purposes of projecting future demand, system losses will be calculated at 3% of the total of the water demand projections for all other user categories.

[12] AWWA, Water Resource Planning; Manual of Water Supply Practices M50, 2001, p33

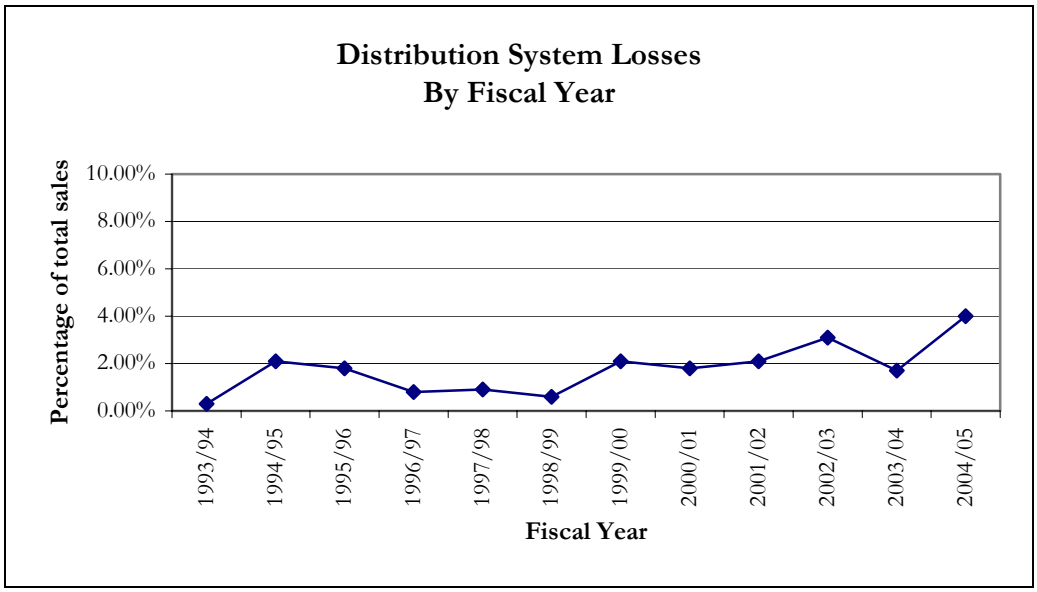

Figure 11, Distribution System Losses by Fiscal Year

Projected Water Use by Sector

As noted earlier the projected water demands for each category of users were prepared using data from the End Use Model prepared by Maddaus Water Management the End Use Model. The projected number of accounts for each user category from the End Use Model is shown in Table 9 below. These tables reflect both potable and recycled water.

Table 9, Projected Water Accounts by Category

Projected water accounts by category						
	2005	2010	2015	2020	2025	2030
Single Family	17,463	18,604	19,617	20,630	21,547	22,463
Multi Family	3,716	3,959	4,174	4,390	4,585	4,780
Commercial	2,792	2,702	2,868	2,986	3,093	3,201
Industrial	457	490	516	535	552	569
Institutional	122	130	137	144	150	156
Municipal	354	377	398	419	437	456
Total	24,904	26,262	27,710	29,104	30,364	31,625

Table 10, Projected Water Usage per Account in AF/Y

Projected water usage per account in AF/Y						
	2005	2010	2015	2020	2025	2030
Single Family	0.3988	0.4105	0.4128	0.4156	0.4183	0.4211
Multi Family	1.4007	1.3685	1.3342	1.3073	1.2858	1.2680
Commercial	2.2194	2.1913	2.1557	2.1299	2.1100	2.0943
Industrial	12.1863	12.1139	12.0605	12.0201	11.9874	11.9603
Institutional	6.5583	6.5583	6.5583	6.5583	6.5583	6.5583
Municipal	1.7128	1.7128	1.7128	1.7128	1.7128	1.7218

Table 10 shows that, in general, the average usage per account is shown to decrease over time. This decrease is the result of conservation, reduction in usage due to equipment and fixture changes and improved efficiency. The residential development trends currently seen in the City are for high density housing with smaller landscaping areas resulting in decreased irrigation demands.

The projected water deliveries for each category of water users are calculated by multiplying the projected number of accounts by the projected average usage per account. The resulting projected water demand by category is shown in Table 11.

Table 11, Projected Water Deliveries in AF/Y

	Projected water deliveries in Acre ft/yr					
	2005	2010	2015	2020	2025	2030
Single Family	6,964	7,638	8,098	8,575	9,013	9,460
Multi Family	5,305	5,568	5,779	6,039	6,205	6,371
Commercial	7,397	8,012	8,443	8,791	9,067	9,244
Industrial	6,364	6,739	7,029	7,234	7,458	7,644
Institutional	1,097	1,140	1,236	1,292	1,354	1,396
Municipal	857	1,026	1,072	1,137	1,189	1,221
System loss	831	864	903	937	969	1,001
Total	28,815	30,986	32,559	34,004	35,254	36,337

Wastewater and Recycled Water

Collection System Description

The wastewater collection system within the City of Santa Clara is owned and operated by the City. A total of 292 miles of sewer mains and 7 pump stations are used to convey an average of 15 million gallons per day of wastewater to the San Jose/ Santa Clara Water Pollution Control Plant (WPCP).

The City of San Jose operates the WPCP under a 1959 Agreement (subsequently amended). The WPCP also treats wastewater from the cities of Milpitas, Campbell, Cupertino, Los Gatos, Monte Sereno, and Saratoga, as well as several unincorporated areas of Santa Clara County. The WPCP service area covers 300 square miles and a population of over 1.3 million people. The WPCP treated an average of 114 million gallons per day during calendar year 2004.

The WPCP is an advanced tertiary treatment plant. A portion of the effluent from the WPCP is re-chlorinated and distributed by South Bay Water Recycling at which point it meets the requirements of California Title 22 for unrestricted use. The remainder of the wastewater is discharged to the Artesian Slough, which leads to the southern portion of the San Francisco Bay.

Current Recycled Water Use

The City's recycled water system has been in operation since 1989. The City has aggressively pursued the use of recycled water including use in industrial processes, residential irrigation and dual plumbed buildings for toilet and urinal flushing. The City has also pursued more traditional uses for recycled water as a drought proof water source for large turf area irrigation in commercial settings.

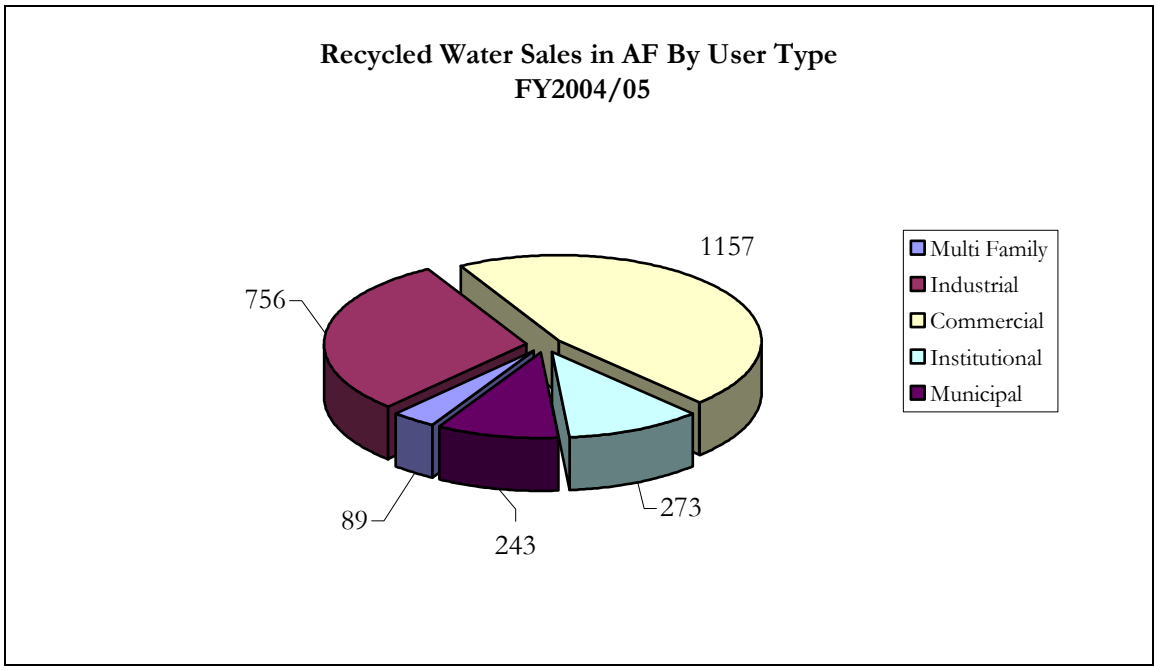

Figure 12, Recycled Water Sales by User Type FY 2004/2005

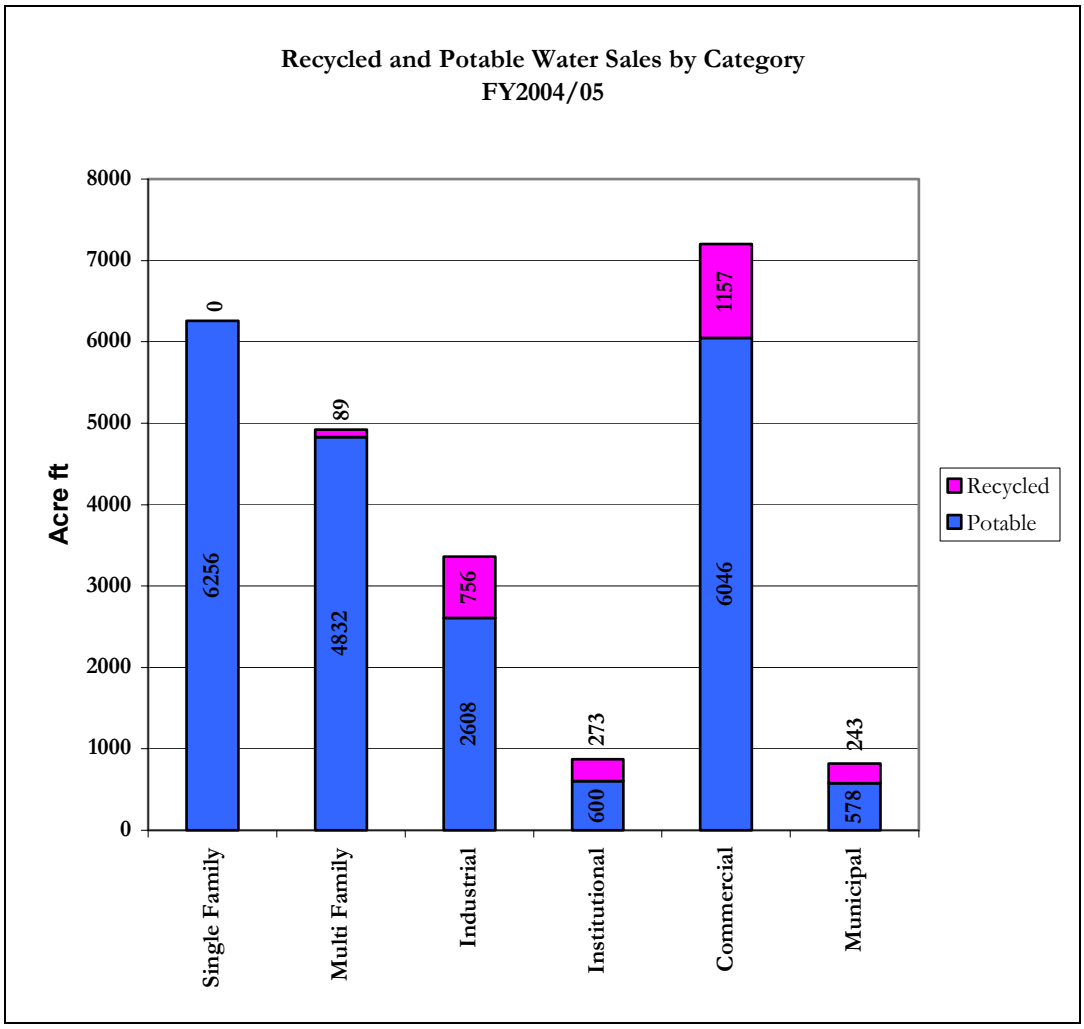

Figure 13, Recycled and Potable Water Sales by Category FY2004/05

Table 12, Recycled and Potable Water Sales by Category FY2004/05

Category	Total water sales in Acre ft (FY04/05)	Recycled water sales in Acre ft (FY04/05)	Recycled water as a percentage of total water sales by category
Single Family	6,256	0.0	0.0%
Multi Family	4,832	89	1.8%
Industrial	4,172	756	15.3%
Institutional	600	273	31.3%
Commercial	6,046	1,157	16.1%
Municipal	578	243	29.6%

Recycled water is currently used within the City for irrigation at golf courses, parks, landscape street medians and schools. Several industries use recycled water in industrial processes, cooling towers and for toilet flushing in dual plumbed buildings. The largest users of recycled water are

California Paperboard, the Santa Clara Golf and Tennis Club, the Don Von Raesfeld Power Generation Facility and Paramount's Great America. The Don Von Raesfeld (DVR) Power Generation Facility is the most recent facility to come on line. It started commercial operation March 18, 2005. California Paperboard uses recycled water in the process for producing paperboard. The DVR Power Generation Facility uses recycled water for cooling and for steam generation. The Santa Clara Golf and Tennis Club and Paramount's Great America both use recycled water for irrigation. Although recycled water has been used in some industrial processes, the predominant use for recycled water remains irrigation

The existing recycled water distribution system was laid out to maximize service to large potential recycled water customers. The recycled water distribution system is shown is Figure 14 below.

Recycled Water Distribution System

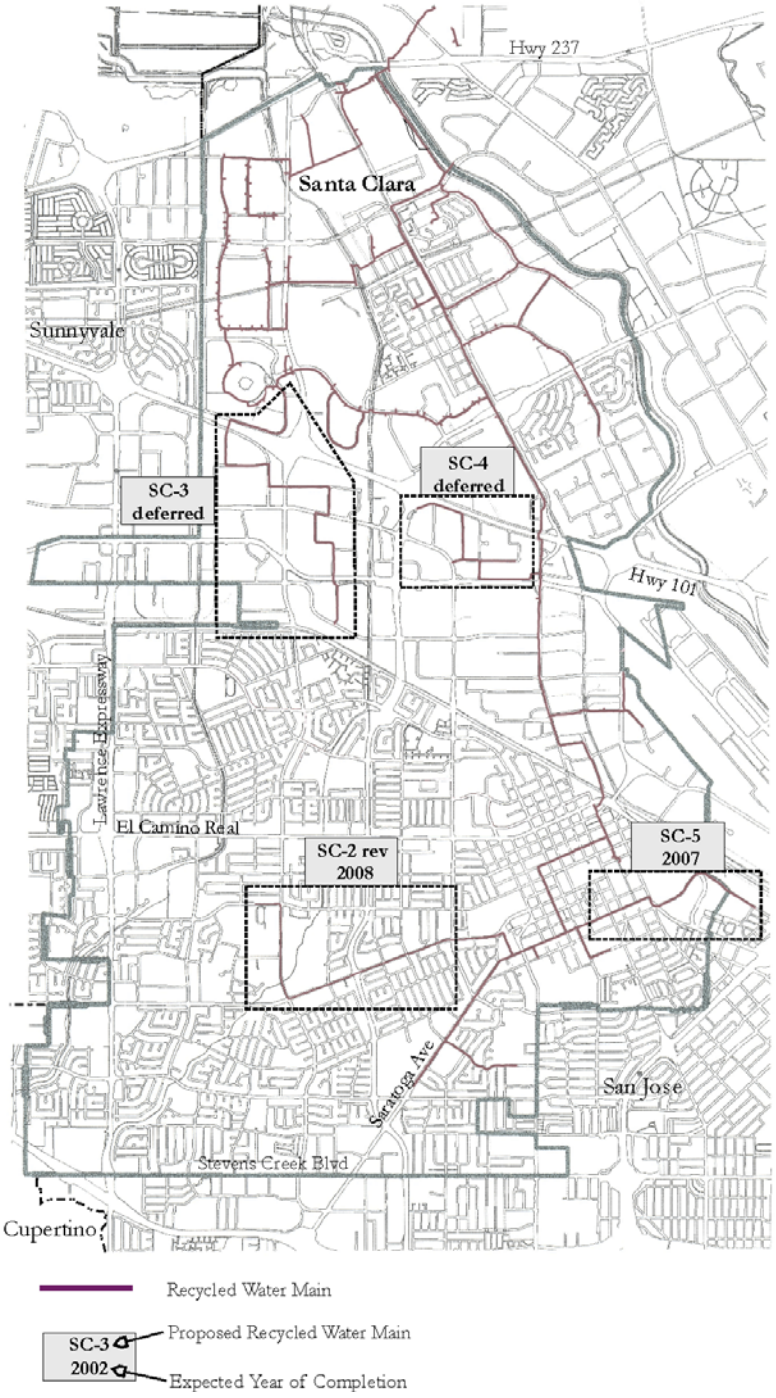

Figure 14, Recycled Water Distribution System

Recycled water sales have grown dramatically over the last 12 years as shown in Figure 15. However, sales of recycled water are currently expected to level out in the year 2025 and beyond based on the known remaining potential recycled water customers. These potential customers are detailed in the section entitled Potential Uses for Recycled Water. The projected recycled water sales shown in Figure 15 and Table 13 deviate from the projections used in the End Use Model prepared by Maddaus Water. At the time the End Use Model was prepared, the DVR Power Generation Facility was not operational and engineering estimates were used to project recycled water usage at the facility. The projections were based on an immediate operation of the facility at full energy production with a corresponding estimated recycled water use of 1.4 MGD. After the DVR power plant began operations it became apparent that the ramp up to full power production would occur over a longer period of time. The estimated recycled water use projections were modified accordingly.

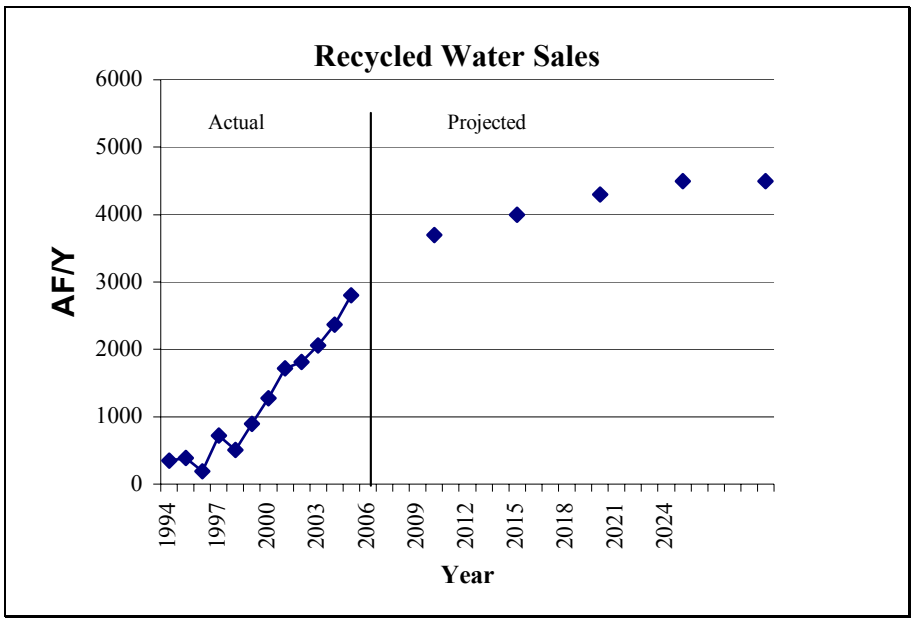

Figure 15, Recycled Water Sales

Table 13, Recycled Water Uses – Actual and Projected

Recycled Water Uses - Actual and Projected in AF							
Year	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Residential	20	100	150	210	300	310	310
Industrial	125	800	800	800	800	840	840
Institutional	200	300	290	340	350	370	370
Commercial	800	1200	2090	2260	2430	2540	2540
Municipal	155	250	380	390	420	440	440
Total	1300	2650	3700	4000	4300	4500	4500

Potential Uses of Recycled Water

The potential future uses of recycled water are the similar to the current uses: irrigation and industrial processes.

Current industrial process uses for recycled water include cooling towers and as process water in paperboard manufacturing. The DVR Power Plant (owned by the City of Santa Clara's municipal electric utility) is expected to use an average of 1.26 MGD with peak water demand of 1.66 MGD.

The last major pipeline extension to be funded by SBWR will supply recycled water to the City's Central Park as well as three schools and some street frontage landscaping. This will add approximately 150 AF/year of recycled water usage. Two other pipeline alignments are identified for supply to commercial/industrial areas of the City. Although these pipeline extensions are not currently proposed for funding due to the reduction in flows to the WPCP, an additional 300 to 400 AF/year of recycled water could be utilized, primarily for irrigation and cooling.

Projected Use of Recycled Water

Several infill projects may be developed along the recycled water distribution system that is currently in place. In addition, two new pipelines are under design: one for improved reliability and one to deliver water for irrigation to the City's Central Park and three schools. Future recycled water use in the City of Santa Clara is expected to grow to more than 3600 AF/year from the 2500 AF/year in FY 2004/05. In addition to the facilities listed in Table 14, the City is projecting increased use by the current recycled water customers and added customers due to new development and redevelopment along the existing recycled water pipelines.

Table 14, Potential Future Recycled Water Customers

Potential Future Recycled Water Customers		
Project	Estimated Annual Recycled Water Use (AFY)	Estimated Year of Conversion to Recycled Water
Central Park	65	2007
Santa Clara High School	50	2007
Milikin Elementary	25	2007
Haman Elementary	10	2007
Total	150	

Some additional customers may be provided with recycled water once additional recycled water distribution mains are installed. These potential customers represent a very small percentage of the potential recycled water sales. Currently the largest potential recycled water users have already been converted to recycled water use. Due to the high cost of distribution system extensions and retrofit costs, it is usually not cost effective to convert smaller potential users to recycled water use.

Description of Actions and Financial Incentives

Pricing Incentives

Recycled water rates are approximately 40% below the comparable rate for potable water, currently $1.042 per HCF v. $1.813 for potable water. A much deeper discount is offered for customers that use recycled water to replace water from a private well. These rates are set so that the customer will see a savings compared with the pump tax (paid to the District) otherwise paid for well water.

Retrofit Assistance

The City, through South Bay Water Recycling, offers design and construction of customer's retrofit to convert existing potable water uses to recycle water uses. In the past, financial assistance was also offered to defray the costs of onsite plumbing changes necessary for compliance with the use restrictions for recycled water. However, since the SJ/SC WPCP is currently below its 120 MGD flow cap, all funding of onsite plumbing changes has been discontinued.

Technical Assistance

In addition to the design of retrofits, technical assistance is also offered for horticultural and landscaping problems and for the permit processing of the State permits for each recycled water use location

Plan For Optimizing Recycled Water Use

All new developments that occur within a "reasonable" distance of the existing or proposed recycled water distribution system will be required to provide a landscape irrigation system constructed for the use of recycled water. The SCVWD and SBWR are studying advanced treatment for the removal of salts from the recycled water currently produced by the WPCP. Future uses of recycled water would be facilitated by this advanced treatment.

Comparison of Water Supply and Demand

Water Supply Projects

Two Proposed Wells

Construction of Wells 32 and 34

The existing 27 wells together with the water supplied by the two imported water wholesalers can provide the delivery capacity to supply the City of Santa Clara's expected water demand for the next 25 years. In the future additional imported supply will likely be required from the imported treated water purchased from the SCVWD. The City is investigating an additional turnout from the SCVWD's wholesale supply of treated imported water. This additional turnout would also increase the flexibility of the water supply system, allowing the City to increase treated surface water utilization and decrease groundwater usage, if necessary. The District is planning for an expansion of the Rinconada Water Treatment Plant that will allow for this added supply to the City of Santa Clara. Both the turnout and the expansion of the RWTP will be completed prior to the City's coming close to exceeding the yield of groundwater aquifer, which is well beyond the planning horizon of this Plan.

Two new wells, designated as wells 32 and 34, are being constructed in the northern part for the City to allow for added reliability in light of the uncertainty of the San Francisco Water Department wholesale supply. That portion of the City is currently supplied by SFWD but the City's water system is insufficient to convey peak-demand water from the primary area of well production south to the north of US 101 (Bayshore Freeway). The two new wells, along with the extensive use of recycled water for summer peak irrigation demand will allow for sufficient supply in the case of a loss of SFWD supply.

If wells 32 and 34 were utilized to the same degree as comparable wells within the system, the utilization factor would be 25%. However, wells 32 and 34 will be run for extended periods if they are used because of the operational considerations of starting and stopping their associated manganese removal systems. Therefore a utilization factor of 35% may also be realistic. The projected annual usage for both 25% and 35% utilization scenarios are listed in Table 15. The

estimated yields listed in Table 15 for wells 32 and 34 assume a wet to normal water year. The yield during single dry year or multiple dry years is apparently as secure to a similar degree as any of the other wells located in Santa Clara since the District represents that they have the ability to secure additional supplies to maintain the groundwater basin.

Table 15, New Wells, Potential Supply

Well	Estimated Yield in GPM	Estimated Yield at 25% UF acre-ft/yr	Estimated Yield at 35% UF acre-ft/yr
Well 32	1,000	400	570
Well 34	1,000 to 1,100	400 to 440	570 to 620
Total	2,000 to 2,100	800 to 840	1140 to 1190

Timeline for Completion of Wells 32 and 34

One or both of these wells will also require treatment/filtration for the removal of naturally occurring manganese. Well 34, within the new Rivermark development, may be completed in the spring 2006. Well 32 will be completed by the fall 2006.

Opportunities for Development of Desalinated Water

The opportunities for the City of Santa Clara to use desalination as a potential source of water are limited. These limitations are due to geographic location and logistics. The City of Santa Clara is located inland for the San Francisco Bay and other sources of seawater or brackish water. Also the City lacks a practical means of brine disposal from a desalination process. The distance from a suitable location for an outfall is significant and the cost would be prohibitive.

Water Quality

Nitrate

The City of Santa Clara has historically relied on groundwater for the majority of the City's water supply. Therefore any contamination of those supplies poses a significant risk to the City's overall water supply. Currently the City monitors its wells for nitrate concentration. Currently 6 wells show concentrations of nitrate at or slightly above ½ the Maximum Contaminant Level (MCL) of 45 ppm of Nitrate. A groundwater nitrate plume is apparently a result of historic agricultural practices and the past use of septic tanks in Santa Clara Valley.

Manganese

The City currently has one well that has shown significant levels of manganese. This well is not being used due to manganese concentrations of above 100 parts per billion (ppb). The use of water with manganese is limited to a "secondary" maximum contaminant limit (MCL) of 50 ppb. Water with manganese concentrations above that will cause stains to plumbing fixtures and laundry and, although not a health problem, can only be delivered to a public water supply with the acceptance of the users. Two new wells under construction also have indications of high manganese. The City is prepared to provide wellhead treatment for manganese removal for one or more of these wells to help assure a reliable supply of water to the Bayshore North neighborhoods.

Assessment of Other Threats to Groundwater Quality

In 2002 the City completed the State mandated Source Water Assessment Program that includes detailed review of all potential sources of contamination to each of the City's 27 drinking water wells. The results of this work is on file with the State Department of Health Service as a part of

their Drinking Water Source Assessment and Protection Program. Although the City's groundwater supply lays below a number of potential sources of contamination (industrial facilities, underground fuel tanks and the by-products of suburban living) the water quality testing has shown the City's groundwater supply meets or betters all State and Federal regulations for drinking water.

Effect of Water Quality on Supply Availability

Nitrate does not appear to currently pose a threat to the availability of ground water. Nitrate levels have been tracked in the south bay for several decades and levels in excess of the MCL have never been found.

Manganese affects the availability of groundwater only as it relates to the cost to treat the groundwater to remove manganese down to an acceptable level. Initial calculations indicated an added cost of $30 to $40 per acre ft of water for chemical, equipment, and personnel costs.

Supply Reliability and Vulnerability

Reliability of Treated Surface Water Provided by Santa Clara Valley Water District and Groundwater

As noted earlier in this UWMP the groundwater production wells are strategically located throughout the City. Locating the wells throughout the City increases the overall reliability of the system. The addition of portable emergency generators also increases the reliability of this water source. These generators are discussed in detail in the Shortage Contingency Plan section of this UWMP

The City has well capacity that is not currently being used. The utilization factor for the City's wells is currently 25% with several wells being used at less than 10% of their rated capacity. Therefore additional capacity exists which could be used to replace the loss of either of the City's imported water supplies. The District has not determined a resource limit to the City's use of groundwater, rather they represent their ability to obtain sufficient quantities of water supply for the overall water requirements as stated in this Plan (see District statement on Page 46).

The Santa Clara Valley Water District has completed a reliability study to assess the vulnerability of their regional raw and treated water delivery systems to certain major disasters including earthquakes and flooding. The three major fault zones in the region, Calaveras, Hayward and San Andreas, each have an expected frequency and energy that has the potential for interrupting the delivery of potable treated water from the District's water treatment plants. The result of the combination of seismic probabilities for each one of these three fault zones indicates about a 1 in 100 chance each year for a major earthquake that could result in a 1 to 2 week interruption of the District treated water supply to the City of Santa Clara. Certain District facilities are also subject to flooding but this is much lesser concern to the City than a seismic event[13].

Another recently identified vulnerability for the District is the reliability of the supplies of regional imported water from the Sacramento/San Joaquin Delta to the District. Recent studies indicate that the system of levees protecting many of the Delta farming islands is extremely vulnerable to catastrophic failure. Under certain conditions levee failure could interrupt the ability to pump treatable water to the State or Federal water projects for delivery to the District. The temporary loss of District imported supply could be replaced in the short term by a combination of increased well production of groundwater and an increase in SFWD supply (within contract limits). The areas of the City served by this District connection could be served via the existing booster pumps at Serra Tanks that have back-up power supplied by a diesel-powered generator. Some additional

[13] Santa Clara Valley Water District, Water Infrastructure Reliability Project, May 2005.

optimization of Zone 2 and Zone 2A zone valves would be required to mitigate an extended loss of District supply [14].

Vulnerability of Treated Surface Water Provided by Santa Clara Valley Water District and Groundwater

Santa Clara Valley Water District's statement regarding water supply reliability:

To maintain water supply reliability and flexibility, the District's water supply includes a variety of sources including local groundwater, imported water, local surface water and recycled water. The District has an active conjunctive water management program to optimize the use of groundwater and surface water, and prevent groundwater overdraft and land subsidence.

Long term planning and modeling analysis performed by the District as part of the Integrated Water Resources Planning Study (IWRP) and UWMP 2005indicates that if additional investments are made, future countywide demands can reliably be met. It is the intent of the District to insure that these additional investments be undertaken in accordance with the IWRP framework, which recommends a flexible resource mix be implemented in phases over the planning horizon. This flexibility allows the District to respond to changing and uncertain future conditions.

The Water Supply will be reliable to meet future countywide demands. The IWRP's strength is its inherent flexibility and integrated approach to water resources management. Although this UWMP presents projection of future water supply by source, ongoing coordination with the District will be necessary to insure projections are consistent with the Districts long-term water management strategies. We will continue to work with the district to refine future long term projections and insure long-term planning efforts are consistent.

Handout 10/19/2005 Water Retailers Meeting

Groundwater is vulnerable to seasonal or climatic shortages due to droughts and/or shortages of water used for groundwater recharge. The Santa Clara Valley groundwater basin is managed by the SCVWD in order to maintain the reliability of the groundwater basin as a source of supply. The District uses both natural and managed groundwater recharge to replenish the basin. Other programmatic specifics are detailed in the SCVWD's 2001 Groundwater Management Plan, which is included as Appendix C.

For the analysis of the vulnerability of both groundwater and treated surface water from the Santa Clara Valley Water District the basis for the normal year, single dry year, and multiple dry years were identical. The specific year or range of years is listed in the table below.

[14] City of Santa Clara 2002 Water Master Plan

Table 16, SCVWD Basis of Water Year Data

SCVWD Basis of Water Year Data	
Water Year Type	**Base Year**
Average Water Year	1985
Single Dry Water Year	1977
Multiple Dry Water Year	1987-92

The District has stated in their draft UWMP that they will meet all of the county's water demands from sources identified in the 2004 IWRP even during these drought scenarios for all county projected demands for the next 25 years. Shortage may still occur due to certain major disasters. However, the District has indicated that their IWRP provides for future water supplies (presumably even in the event of a multiple dry year scenario) a 5% decrease in available water supplies (combined groundwater and treated water) is the maximum impact anticipated in any given year. The documentation of the Districts statements regarding available water supplies is included in Appendix E. For purposes of this UWMP the water supply from the SCVWD is projected to be sufficient to meet projected demands based on the information contained in Appendix E and the statement distributed by the SCVWD, which is shown in the sidebar above.

Table 17, Groundwater and treated surface water availability in Multiple Dry Years

		Deliveries During Multiple Dry Years		
Groundwater and SCVWD Treated Surface Water	**One Critical Dry Year**	**Year 1**	**Year 2**	**Year 3**
% of projected demand	100%	100%	100%	100%

Reliability of Treated Surface Water From San Francisco Water Department

During the drought that occurred from 1986 to 1992, the reservoirs within the Hetch-Hetchy system became seriously depleted, indicating the system is less reliable during dry periods than previously thought. The San Francisco Public Utilities Commission (SF-PUC) has also identified serious concerns about portions of the Hetch-Hetchy system that are aging and in need of repair or replacement. In addition, due to the age of the system, most facilities are not designed to current seismic standards and the system is vulnerable to earthquakes. An earthquake or similar catastrophic event could result in a prolonged disruption of the Hetch-Hetchy system with loss of service for 2 to 4 months. The SF-PUC recently completed an evaluation of the Hetch-Hetchy water system that indicates more than $3.6 billion in infrastructure replacement and upgrades are necessary to insure the capacity and reliability of the water system for the suburban users[15].

In order to enhance the ability of the SF-PUC water supply system to meet identified service goals for water quality, seismic reliability, delivery reliability and water supply, the SF-PUC is undertaking a Water System Improvement Program (WSIP). The WSIP will design and construct

[15] San Francisco Public Utilities Commission, Bay Area Water Users Association: Water Supply Master Plan - A Water Resource Strategy for the SFPUC, April 2000

capital improvements aimed at enhancing the SF-PUC's ability to meet its water service mission of providing high quality water to its customers in a reliable, affordable and environmentally sustainable manner.

The origins of the WSIP are rooted in the SFPUC "Water Supply Master Plan" (April 2000). Planning efforts for the WSIP gained momentum in 2002 with the passage of San Francisco ballot measures Propositions A and E, which approved the financing for the water system improvements. Also in 2002, Governor Davis approved Assembly Bill No. 1823, the Wholesale Regional Water System Security and Reliability Act. The WSIP is expected to be completed by 2016.

SF-PUC has assessed its water supply reliability capabilities during single dry year, multiple dry years beginning in 2005, and supply reliability for years 2010, 2020, 2025 and 2030 (Appendix F). The assessment of the capabilities of the Hetch Hetchy system to provide water during single and multiple dry years was based on an analysis of actual historic hydrological period 1920 through 2002 and demand projections from 2005 forward. The SF-PUC assumed that the historical hydrological period was indicative of potential future events. The results of that assessment are listed below.

Table 18, SFWD Basis of Water Year Data

SFWD Basis of Water Year Data	
Water Year Type	**Base Year**
Average Water Year	1985
Single Dry Water Year	1987
Multiple Dry Water Year	1987-1992

Table 19, SFWD Deliveries During Single Dry Years

SFWD Single Dry Year	2010	2015	2020	2025	2030
Water supply AFY	5,500	5,500	5,500	5,500	3,842
% of Normal (5,500 AF/yr)	100%	100%	100%	100%	70%

Table 20, SFWD Deliveries During Multiple Dry Years

SFWD Multiple Dry Year						
Dry Period Starting 2010	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Water supply AFY	5,500	3,461	3,461	3,013	3,013	3,013
% of Normal (5,500 AF/yr)	100%	63%	63%	55%	55%	55%
Dry Period Starting 2015	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Water supply AFY	5,500	3,517	3,517	3,517	3,517	3,058
% of Normal (5,500 AF/yr)	100%	64%	64%	64%	64%	56%
Dry Period Starting 2020	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Water supply AFY	5,500	3,629	3,629	3,159	3,629	3,159
% of Normal (5,500 AF/yr)	100%	66%	66%	57%	66%	57%
Dry Period Starting 2025	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Water supply AFY	5,500	3,741	3,741	3,260	3,260	3,260
% of Normal (5,500 AF/yr)	100%	68%	68%	59%	59%	59%
Dry Period Ending 2030	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Water supply AFY	3,842	3,360	3,842	3,360	3,360	3,360
% of Normal (5,500 AF/yr)	70%	61%	70%	61%	61%	61%

Vulnerability of Treated Surface Water From San Francisco Water Department

The SF-PUC can meet the demands of its retail and wholesale customers in years of average and above-average precipitation. The Master Contract allows the SF-PUC to reduce water deliveries to wholesale customers during periods of water shortage. Under the Master Contract, reductions to wholesale customers are to be based on each agency's proportional purchases of water from the SF-PUC during the year immediately preceding the onset of shortage, unless this formula is supplanted by a water conservation plan agreed to by all parties.

The Master Contract's default formula discouraged SF-PUC's wholesale customers from reducing purchases from SF-PUC during periods of normal water supply through demand management programs or development of alternative supplies. To overcome this problem, SF-PUC and its wholesale customers adopted an Interim Water Shortage Allocation Plan (IWSAP) in calendar 2000. This IWSAP applies to water shortages up to 20% on a system-wide basis; the Plan will remain in effect through June 2009. The projected amount of water that the City of Santa Clara expects to receive from SF-PUC during dry years after 2010 shown in Table 20 is based on an assessment of the capabilities of the Hetch Hetchy system to provide water during multiple dry years based on an analysis of actual historic hydrological period 1920 through 2002.

The temporary loss of SFWD Hetch-Hetchy supply would eliminate the single-source supply of water to Zone 1A industrial customers. Well water could be used to temporarily replace the loss of

water from SPWD Hetch-Hetchy supply; long-term replacement of SF-PUC supply would require a new connection and a new agreement with the District for additional treated water. The District connections would need to be modified and automated to allow a direct supply of District water into the transmission main to serve Zone 1. The two new production wells (Wells 32 and 34) currently under construction would also be critical in replacing the potential loss of SFWD supply[16].

Reliability of Recycled Water

The South Bay Water Recycling system has some inherent problems with reliability: it is not constructed to provide reliability at the same level as the City's potable water system. There is one transmission pump station and few conveyance pipes with very little "looping" for reliable service. This situation will be improved by the new "reliability improvement project" that will provide a redundant connection through San Jose for the southerly portion of the City's recycled water system. Two new reservoirs are also under construction that will improve reliability and ease operations of the SBWR system. The reservoirs will add 5.5 MG of storage capacity and should be on line in December of 2006.

Vulnerability of Recycled Water

Recycled water is not vulnerable to seasonal or climatic shortage. The volume of influent to the San Jose/ Santa Clara Water Pollution Control Plant far exceeds the recycled water system's delivery capability and there is not a requirement for a minimum discharge volume from the water pollution control plant. The table below shows the projected influent volume to the San Jose Santa Clara Water Pollution Control Plant based on detailed analysis[17]. Appendix G contains the full analysis of projected influent volumes.

Even in the event of multiple dry years, the projected recycled water deliveries would still be a fraction of the influent volume. Therefore, recycled water is assumed to be a drought-proof water supply.

Table 21, Recycled Water Production

Recycled water production in 1000 AF/Y							
	2000	2005	2010	2015	2020	2025	2030
Wastewater collected and treated	146	134	137	142	150	157	165
Volume that meets recycled water standards	146	134	137	142	150	157	165
Projected System Wide Recycled Water Usage	4.5	7.8	10.1	13.4	16.8	20.2	23.5
Projected In Plant Recycled Water Use	1.1	3.4	4.5	4.5	4.5	4.5	4.5
Projected Volume Discharged	140	123	122	124	129	132	137

[16] City of Santa Clara 2002 Water Master Plan
[17] Projections for Influent Hydraulic Flow to the SJ/SC WPCP, Van Keuren, 2005

Supply Verses Projected Demand

Table 22 and Figure 16 below show how the City intends to meet the projected water demand. This table and figure represent how the City will meet this demand but does not indicate the total available capacity of each resource. Additional potential capacity exists for 3 of the 4 sources of water. Recycled water has additional potential if existing customers increase their use of recycled water, additional customers are connected to the existing distribution system, or the distribution system is expanded. The SCVWD treated surface water component could be increased if the structural changes described elsewhere in this UWMP were completed. The groundwater component of the water supply has additional potential capacity, the total amount of which is dependant on the SCVWD's groundwater recharge program, the amount of natural recharge, and the carryover storage from previous years, and depth to groundwater. The current utilization factor for the City's groundwater wells is 24%. A detailed table of the utilization factor for the individual wells is contained in Appendix H. At the 2030 projected groundwater pumping rate of 20,387 acre ft/yr, the utilization factor will be 33% with the current production wells and approximately 32% when wells 32 and 34 are placed into production.

Table 22, Source of Water Supply

Projections by Water Source AF/Y						
Source	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Groundwater	15,579	16,298	17,257	18,346	19,340	20,387
SFWD	5,500	5,500	5,500	5,500	5,500	5,500
SCVWD	4,750	4,570	4,570	4,570	4,570	4,570
Recycled Water	2,650	3,700	4,000	4,300	4,500	4,500
Conservation	336	918	1,232	1,288	1,344	1,380
Total	28,815	30,986	32,559	34,004	35,254	36,337

The demand projections listed above were provided in writing to the City's wholesale water suppliers, the SCVWD and SFWD.

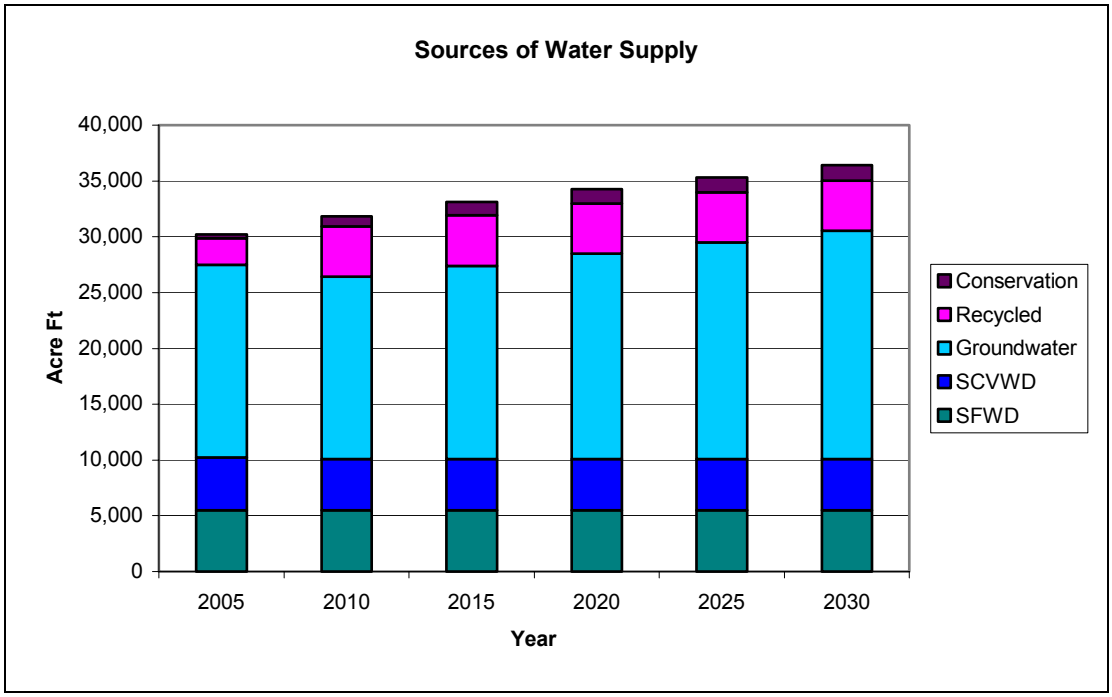

Figure 16, Sources of Water Supply

As noted in the previous section entitled Supply Reliability and Vulnerability, the sources of water supply for the City are susceptible to seasonal or climatic shortages due to droughts. Based on the information provided by the City's water wholesalers regarding the availability of water supply during normal, single dry year, and multiple dry year scenarios, the City has projected a maximum shortage of 8% in any given year out to 2030. During normal water years, water supplies should be adequate to meet projected demands as seen in Table 23.

Table 23, Projected Supply and Demand Comparison - Normal Year

Projected Supply and Demand Comparison - Normal Year- AFY					
	2010	2015	2020	2025	2030
Supply Totals	30,986	32,559	34,004	35,254	36,337
Demand Total	30,986	32,559	34,004	35,254	36,337
Difference as a % of Supply	0	0	0	0	0
Difference as a % of Demand	0	0	0	0	0

During a single dry year, the City projects no reduction in supplies from groundwater and SCVWD treated surface water. SFWD has indicated that during a single critical dry year the City can expect a maximum reduction of water supplies of 30% in water deliveries in 2030. According to the analysis, no reduction in water deliveries would occur in 2010, 2015, 2020 or 2025 as a result of a single dry year event. Recycled water use and water conservation are projected to remain unchanged during a critical dry year. The resulting analysis of available supplies is shown in Table

24 below. During a single critical dry year, the projected shortfall in available water supplies should be no more than 5% and that shortfall would only occur in 2030.

Table 24, Projected Supply and Demand Comparison - Single Dry Year

Projected Supply and Demand Comparison Single Dry Year - AFY					
	2010	2015	2020	2025	2030
Supply Totals	30,986	32,559	34,004	35,254	34,679
Demand Total	30,986	32,559	34,004	35,254	36,337
Difference as a % of Supply	0%	0%	0%	0%	5%
Difference as a % of Demand	0%	0%	0%	0%	5%

During a multiple dry year event, the City projects no reduction in supplies from groundwater and SCVWD treated surface water based on analysis provided by the District shown in Appendix E. SFWD has indicated that during multiple critical dry years the City can expect a maximum reduction of SFWD water supplies of 45%, as shown in Table 20. Recycled water use and water conservation are projected to remain unchanged during a multiple dry year event. The resulting analysis of all available supplies is shown in Table 25 below. For SFWD supplies, Table 25 assumes a worst-case scenario based on a replication of the 1987-1992 multiple dry year event with the volume shown being the supply available in the final year of the multiple dry year event (Table 20). The water supply shown as available in 2010 is based on the supply assurance in the Interim Water Shortage Allocation Plan based on a 20% system wide shortage. During a multiple critical dry year event, the projected shortfall in available water supplies should be no more than 9%.

Table 25, Projected Supply and Demand Comparison - Multiple Dry Year

Projected Supply and Demand Comparison Multiple Dry Years – AF					
	2010	2015	2020	2025	2030
Groundwater	16,298	17,257	18,346	19,340	20,387
SFWD	3,013	3,013	3,058	3,159	3,260
SCVWD	4,570	4,570	4,570	4,570	4,570
Recycled Water	3,700	4,000	4,300	4,500	4,500
Conservation	918	1,232	1,288	1,344	1,380
Supply Totals	28,499	30,072	31,562	32,913	34,097
Demand Total	30,986	32,559	34,004	35,254	36,337
Difference	2,487	2,442	2,341	2,240	2,140
Difference as a % of Supply	9%	8%	8%	7%	7%
Difference as a % of Demand	8%	8%	7%	7%	6%

Water Shortage Contingency Plan

The City's water system benefits from flexibility due to multiple distributed sources. With 27 production wells currently in operation, two imported water suppliers and an extensive recycled water system the City's water system has been historically very reliable. The loss of a single supply, storage tank, well, or imported water connection can be offset, in most cases by relying on the other remaining sources. Back up power supplies (diesel generators) have been strategically located throughout the City for wells and booster pumps. In addition, 4 of these back up generators are portable and can be moved as necessary to other locations within a matter of hours.

Earthquake

An earthquake could collapse or otherwise damage some well casings resulting in a significant reduction in production capacity or the complete loss of production from a well. Historically the wells in Santa Clara have not suffered any damage in previous earthquakes such as the Loma Prieta earthquake in 1989. The Loma Preita earthquake, at 7.0 on the Richter scale with an epicenter in the nearby Santa Cruz Mountains, is the most recent significant seismic event. The City conducted a seismic vulnerability study in 2003[18]. The study examined the vulnerability of the Santa Clara water system in the event of a magnitude 7.9 earthquake on the San Andreas fault and a magnitude 7.1 earthquake on the Hayward fault. The study found that Santa Clara would most probably be isolated from the Hetch Hetchy and SCVWD imported water systems. The loss of both imported water supplies would result in a loss of approximately 32% of the water currently used to meet customer needs. However, the report found that the City's wells and storage were sufficient to meet average day demands even with the loss of both imported water sources.

Damage to the distribution system from either of the two earthquakes described would also result in 11% to 20% of the City's customers being isolated from piped water supplies. The report estimated it would take between 15 to 39 days to restore service to all effected customers.

The City has begun a seismic capital improvement program that will increase the reliability of the City system in the event of an earthquake. All of the City's water storage tanks will require retrofit of the existing piping connections to allow for greater flexibility for movement. These retrofits are scheduled for completion in 2006. One elevated storage tank (500,000 gallon) will need to be removed from the system and replaced or alternative operations implemented.

Loss of Wells

The possibility of losing the production from a single or several wells is slight but could occur due to an earthquake (well collapse) or contamination.

The City wells are all constructed to current standards in order to prevent possible contamination of the City's drinking water. The City has also completed a Source Water Assessment Program that examined potential sources of contamination. However, currently eight wells have shown a level of nitrates greater than half the MCL. The potential exists that Nitrates could render several wells unusable if the level increased to a concentration in excess of the MCL. However, the recorded nitrate levels across the aquifer have not shown levels above the MCL, so the probability of the nitrate level increasing to that level is extremely remote.

Earthquakes have the potential to damage a well by collapsing the well casing or changing the yield of the aquifer from which the well draws. The wells are geographically distributed within the City such that the loss of one or two wells within a pressure zone will not affect the system's ability to

[18] City of Santa Clara, Seismic Vulnerability Assessment, G7E Engineering March 15, 2003

meet the water demand by increasing production from other wells. As noted in Appendix H, the wells within the City have an average utilization factor of 24% with some wells utilized at less than 10% of their rated capacity. Therefore sufficient capacity exists for the City to maintain consistent water delivers even with the loss of multiple wells due to an earthquake or other factors.

Loss of Imported Water Supplies

The water system can offset the temporary loss of either (or both) imported water supplies by the expedient of increased pumping of groundwater. The long-term loss (for more than a year) of either or both imported supplies would, however, probably result in the eventual over-draft of the City's portion of the regional groundwater basin. The City water system can accommodate the increased use of groundwater through the increased operation of storage tanks and their associated booster pumps during periods of high water demand. This mode of operation would also place more demands on the pumping equipment while leaving the system more vulnerable to equipment failure.

The loss of SFWD Hetch-Hetchy supply would eliminate the single-source supply of water to Zone 1A industrial customers. This loss can be only temporarily replaced with well water; long-term replacement would probably require a new connection and a new agreement with the District. The District connection would need to be modified and automated to allow a direct supply of District water into the transmission main to serve Zone 1. The two new production wells (Wells 32 and 34) currently under construction in the Rivermark area would also be critical in replacing the potential loss of SFWD supply.

The temporary loss of District imported supply could be replaced in the short term by a combination of increased well production of groundwater and an increase in SFWD supply (within contract limits). The areas of the City served by this District connection could be served via the existing booster pumps at Serra Tanks that have back-up power supplied by a diesel-powered generator. Some additional optimization of Zone 2 and Zone 2A zone valves would be required to mitigate an extended loss of District supply.

The City of Santa Clara water distribution system has been shown to be very robust in its ability to meet all demands for the peak day and peak hour, for now and for the future expected demands. Fire flow analyses for certain sections of the City indicate minor improvements in system piping would greatly improve pressures that would be available for fighting a major fire. The loss of SFWD (Hetch-Hetchy) water can be accommodated with the existing system for short-term loss including a potential 3 to 4 month outage that is currently expected from a major earthquake.

The long-term replacement of SFWD supply would require an additional connection to the District's distribution system and an agreement with the District to provide additional supplies of treated water to the City of Santa Clara.

Loss of Electrical Power

The City of Santa Clara, like most water utilities is dependent on electrical power to pump water from wells, into and out of storage tanks, and at several points in the distribution system. The City of Santa Clara purchases electrical power from Silicon Valley Power (SVP), the City's municipal electric utility. SVP has taken steps to ensure the reliability of the local power supply including the recent completion of the Don Von Reasfeld Power plant, which is capable of generating one-third of the City's total electric demand. The Don Von Reasfeld Power Plant increases the reliability of the electrical power to the water utility since the power plant is located within the City limits.

Despite the reliability of SVP, the water utility has placed back up power supplies at 7 strategic water supply facilities around the city. Four of these back up power supplies are portable and can be moved as needed to other locations within the water utility. Electrical connections at the various

well sites and booster pump stations are standardized to allow for quick connection of the portable generators at each location. These combined sources (wells with backup power) are sufficient to meet the low expected system demand during a regional or citywide power outage. The City also has sufficient supply of diesel fuel for several weeks of such operations.

Minimum Available Water Supply For Next Three Years

The Santa Clara Valley Water District has performed an analysis of the projected groundwater supply in the event of multiple dry years. The analysis was based on the driest 3-year historic sequence. In the 125-year record for San Jose rainfall gage #86, the driest 3-year sequence occurred from 1987 through 1989.

The groundwater basin is currently at one of the highest levels seen in the last 85 years. Based on current groundwater basin storage, planned recharge volumes, expected imported water supply deliveries, and current reservoir levels, the SCVWD expects to be able to meet projected demand over the next three years even if a repeat of the historic driest 3-year sequence were to occur. The District has identified additional supplies in their IWRP to mitigate any further shortages and "to insure the water supply will be reliable to meet future countywide demands".

As noted earlier in this UWMP, SF-PUC has assessed its water supply reliability capabilities during single dry year, multiple dry years beginning in 2005. The assessment of the capabilities of the Hetch Hetchy system to provide water during single and multiple dry years was based on an analysis of actual historic hydrological period 1920 through 2002. The results of that analysis are shown in Table 26.

Table 26, Minimum Available Water Supply Next 3 Years

		Deliveries During Multiple Dry Years		
	One Critical Dry Year	Year 1	Year 2	Year 3
Groundwater AF/Y[19]	15,579	15,723	15,867	16,155
SCVWD Treated Water AF/Y	4,750	4,750	4,750	4,750
Hetch Hetchy AF/Y	3,013	3,013	2,621	2,621
Recycled Water AF/Y	4,500	4,500	4,500	4,500

Although the 45% to 52% reduction in the supplied water from Hetch Hetchy appears at first glance to be significant, Hetch-Hetchy is 18.2 % of the total water supply. The 45 % to 52% reduction in water supplied from Hetch Hetchy represents only an 8.2% to 9.5% reduction in the City's overall potable water supply. Therefore, the minimum available water supply for the next three years would be 90% to 92% of projected demand, if it were assumed that additional supplies are not available from the three other water sources in the City.

[19] The groundwater volumes shown are equal to the projected utilization for the next three years. The SCVWD modeling indicates that adequate supplies exist to meet projected use. Additional capacity may exist, however the SCVWD has not supplied documentation of the maximum supply of groundwater that would be available to the City. Therefore, the projected usage is shown.

Additional water supplies may be available from the three other water supplies, however some physical and logistical limitations exist. For example, the recycled water system is capable of delivering recycled water far in excess of current demand. However only customers that are located near the recycled water distribution system, that have a permitted use and have been connected to the system can use recycled water. In addition, as discussed earlier in this UWMP the treated water connection with the SCVWD is physically limited in the volume that can be delivered to the City.

Consumption Reduction Methods

If a 50% reduction in water demand were to become necessary due to a catastrophic event and/or severe drought, the City would achieve such a reduction through the use of water use restrictions, penalties, and "increasing block" water rates.

During the previous drought, the City established water budgets based on historic usage for all customers and levied penalties when water use exceeded the established budget. Establishing water budgets for each customer required excessive work by City staff and was not well received by the public. The City processed a high number of appeals based on "special circumstances" and there was perceived inequities in the way water budgets were established. Based on the City's experience with that past methodology, an "increasing block" water rate structure will be proposed when managed reductions in water usage are needed in the future.

Increasing block rates have generally been accepted as relatively simple to explain and sending a strong conservation oriented price signal to the customer[20]. If the increasing block rate is properly designed, it should enable the City water utility to remain revenue neutral (neither over earning nor under earning) during a drought[21]. The City of Santa Clara billing system has the capability of establishing increasing rate blocks for each customer class. With City Council approval such modifications in rate structure could be put in place in a matter of days.

The consumption blocks over which the rate will change and the amount of the rate change between blocks will be established in direct response to the severity of the reduction needed. As all rates are set by City council action, the specific rates to be charged are not set out in this UWMP; the following discussion is for example purposes only.

Figure 17 shows a sample distribution of water usage by single-family residential accounts from July of 2005. In establishing a tiered rate structure to reduce the water demand by 50%, the water utility would propose setting the first tier at the 50% of the average annual usage for all single family residential accounts. In this example the first tier would be for up to 7 HCF per month. The second tier would be set to apply to water usage from 50% of the annual average up to the annual average or from 7 HCF to 15 HCF per month. The third tier would be set from 15 HCF per month to 23 HCF. Usage in excess of 23 HCF (which corresponds to one-half of total water sales for residential in the distribution shown) would be billed at the 4th tier. The specific pricing for the individual tier would be determined by financial analysis in order to insure that the rate would be revenue neutral and specific rates would have to be approved by the City Council.

[20] Principles of Water Rates, Fees and Charges, AWWA Manual M1, pp 100-102
[21] Principles of Water Rates, Fees and Charges, AWWA Manual M1, p 100

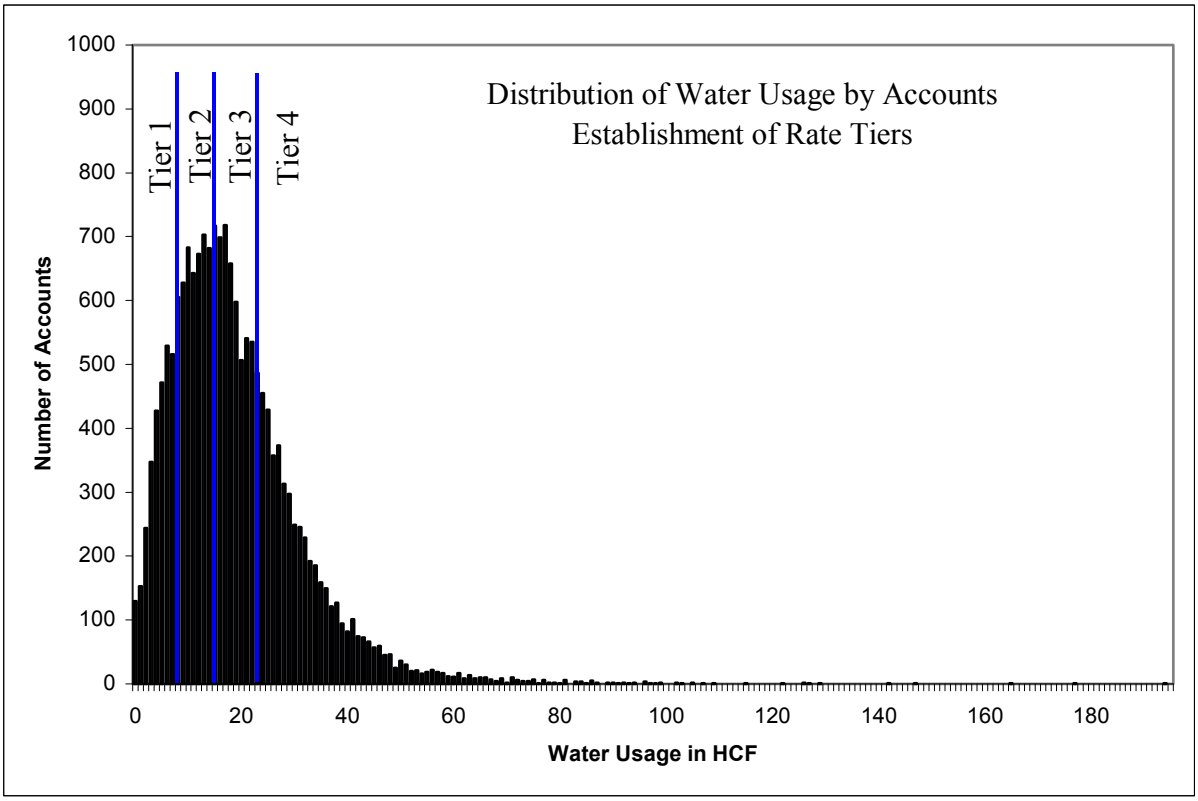

Figure 17, Water Account Distribution, Establishment of Rate Tiers

The rates for the individual tiers could be set similar to the following:

Tier	Range	Example Rate
Tier 1	Up to 7 HCF	Prevailing rate
Tier 2	7 HCF to 15 HCF	1.5 times the prevailing rate
Tier 3	15 HCF to 23 HCF	2.0 times the prevailing rate
Tier 4	Over 23 HCF	2.5 times the prevailing rate

The increasing rate blocks as described should reduce the usage in the top two tiers significantly if the pricing of the rates for these tiers is set correctly. In addition, the median water usage should also be reduced as individuals conserve in order to avoid paying the higher rate tiers.

The methodology outlined above is an example of how the water utility could approach setting the levels for an increasing rate block structure in order to achieve a 50% reduction in water demand should such an extreme reduction become necessary. The water utility is not proposing a specific rate structure as part of this UWMP. Although the water utility can propose changes in the rate or rate structure, the City Council must approve such a change. The tiered rate structure would be used in conjunction with public education and specific water use prohibitions.

In addition to an increasing block rate structure, the water use restrictions listed in the table below will be implemented.

Table 27, Consumption Reduction Matrix

Plan Drought Stage Reduction	Plan 1 Advisory Up to 10%	Plan 2 Voluntary 10% to 20%	Plan 3 Mandatory 21 to 49%	Plan 4 Emergency Curtailment 50% or greater
1. Water Use Reduction Target				
a) Single Family	NA	80% - 90% of base year	50% -80% of base year	50% of base year
b) Master metered multi-family	NA	80% - 90% of base year	50% -80% of base year	50% of base year
c) Inverted rate block for residential usage	No	No	Yes	Yes
d) Non-residential	NA	80% - 90% of base year	50% -80% of base year	50% of base year
e) Inverted rate block for non-residential usage	No	No	Yes	Yes
2. Water Use Restrictions				
a) Water waste by irrigation	Prohibited	Prohibited	Prohibited	Prohibited
b) cleaning sidewalks, hard surfaces etc.	Prohibited	Prohibited	Prohibited	Prohibited
c) Washing vehicle w/o shut off valve on hose	Prohibited	Prohibited	Prohibited	Prohibited
d) Decorative fountains, operating maintaining	No restriction	Prohibited	Prohibited	Prohibited
e) Water for construction purposes	No restriction	Restricted (1)	Restricted (1)	Restricted (1)
f) Water Waste due to defective plumbing / leaks	Prohibited	Prohibited	Prohibited	Prohibited
g) Landscape irrigation	No restriction	Prohibited from 9AM to 6PM	Prohibited from 9AM to 6PM	Prohibited
h) Restaurant water service unless patron requests	No restriction	Prohibited	Prohibited	Prohibited
i) New swimming pool or pond construction	No restriction	Restricted	Restricted	Prohibited
j) Filling or refilling swimming pools	No restriction	Restricted	Restricted	Prohibited
k) Hydrant flushing, except for health and safety	No restriction	Prohibited	Prohibited	Prohibited
l) New irrigation connections for new planting	No restriction	Restricted (2)	Restricted (2)	Prohibited (2)
m) Irrigation of golf courses except greens and tees	No restriction	No restriction	Restricted (1)	Restricted (1)
3) Enforcement				
a) First violation	Warning	Warning	Warning, Citation, up to $500 fine	Warning, Citation, up to $500 fine
b) Second violation	Warning	Warning	Warning, Citation, $100 to$1,000 fine	Warning, Citation, $100 to$1,000 fine
c) Subsequent violations	Warning, citation, $100 to$1,000 fine, flow restrictor	Warning, citation, $100 to$1,000 fine, flow restrictor	Warning, citation, $100 to$1,000 fine, flow restrictor, termination of service	Warning, citation, $100 to$1,000 fine, flow restrictor, termination of service
d) Restrictor removal charge	$50	$50	$50	$50
e) Second restrictor removal charge	$100	$100	$100	Remains for duration

1. Recycled water only
2. New landscaping supplied by recycled water allowed without restriction

Mechanism for Determining Actual Reductions

The City utility billing system can generate custom reports that can be used for tracking water usage by users or by customer class.

The utility currently uses a number of standardized reports to track water usage, production and revenues. Custom reports can be requested and such reports are generally available within a day or two of the request being made. Reports are emailed to the requestor as a spreadsheet for ease of additional data analysis. In the event that the consumption reduction methods outlined above became necessary, these reports would be used to determine and track actual reductions in water consumption.

Financial Impact Mitigation

In order to mitigate the financial impacts of reduced water sales during a drought, the City Council has the authority to impose a drought surcharge on water rates. This surcharge could be a flat fee per hundred cubic feet that is intended to provide the City's water utility with dependable revenues when water use reduction plans are in effect.

The City has traditionally used a "postage stamp" rate for all water sales. With reduction in sales, the fixed costs will remain, imposing a loss on the utility (expenses in excess of revenues). One advantage of tiered rates and/or a drought surcharge is either could be designed and set to allow sufficient revenue to meet all costs for the utility.

The water utility also has reserves that it has used in the past as a rate stabilization fund. These reserves are now being used in help reduce the rate impact from ever-increasing wholesale costs and the lower water sales due to the recent economic down-turn. A steady predictable increase in retail water rates of about 4% to 8% per year is expected over the next 8 to 10 years. This will allow for the replacement of water utility reserves and for sufficient revenue for added capital projects for infrastructure replacement. The water utility's reserves are intended to be at the level that is sufficient to cover short-term loss of revenues due to a drought or other short-term catastrophic loss of sales.

Draft Water Shortage Contingency Resolution

A draft shortage contingency resolution is included in Appendix I of this UWMP. The City Council has full authority to establish and adjust water rates because the City of Santa Clara operates a municipally owned water utility. Approval of the Public Utilities Commission is not required to raise or establish water rates, fees, or surcharges.

Demand Management Measures

The City of Santa Clara has a demonstrated commitment to water conservation and recycling. A number of the Demand Management Measures offered by the City are actually programs run by the Santa Clara Valley Water District. These programs are funded through the wholesale water rates paid by the City. Table 28 below lists each program discussed in this section and indicates whether the City or the District administers the program. The table also indicates programs that the district administers but the City augments through local efforts. Each demand management measure is discussed in detail below. An estimate of the amount of water conserved is included where a reasonable and generally accepted method of developing such an estimate exists.

Table 28, Demand Measurement Implementation Matrix

Demand Management Measure	City Program	District Program Augmented by the City	District Program
Water audits and incentives		X	
Residential plumbing retrofits		X	
Distribution system	X		
Metering and commodity rates	X		
Large landscapes		X	
Public information		X	
School education		X	
High efficiency clothes washer rebate			X
Commercial, industrial, and institutional accounts			X
Conservation pricing	X		
Conservation coordinator	X		
Water waste prohibitions	X		
Ultra low flow toilets			X

Legal Authority to Implement Demand Management Measures

The City of Santa Clara Water Utility as a municipally owned water utility has the legal authority to implement demand management measure by ordinance or resolution through the City Council. This authority has been proven through past implementation of demand management measures, fees, and penalties.

Estimate of Further Ability to Reduce Demand by Conservation

A study was conducted as part of the San Francisco PUC documentation in support of their proposed capital projects for improvement of the Hetch Hetchy system: Wholesale Customer Water Conservation Potential[22]. This study began with the examination of 75 potential conservation measures. These 75 potential measures were screened down to 31 measures that met specific criteria. The list of 31 potential measures was eventually condensed down to 22 measures once duplicative or overlapping measures were combined. The 22 potential conservation measures include some measures that the City has already implemented such as residential water audits. However, some of the potential measures are over and above the programs required to satisfy the BMPs. The potential conservation measures were then grouped into logical programs designated as Programs A, B, and C.

The study indicates that by 2030, additional conservation savings of 1,980 acre-ft/yr for the City of Santa Clara will be realized due to the natural replacement of toilets, showerheads and other water using fixtures with ones that meet current efficiency standards. The conservation savings from plumbing code requirements for water efficient fixtures is included in the demand projection contained elsewhere in this UWMP.

[22] Wholesale Customer Water Conservation Potential Technical Report, URS Corporation, Maddaus Water Management, Jordan Jones and Goulding, December 2004

The implementation of A, B, and C conservation programs could result in a 725, 1,130 to 1,380 acre-ft/yr savings respectively added savings. The potential conservation savings is for these programs is 2%, 3% and 4%, based on a total water demand in 2030 of 36,337 acre ft/yr. These water demand reductions are shown in the Supply Verses Projected Demand section of this UWMP.

Water Audits and Incentives

Residential Surveys

In the previous UWMP the City identified the goal of offering audits to the top 20% of single and multi-family accounts. These audits were offered though the SCVWD Water Wise House Call Program. By July 1, 2008, the District anticipates completing residential surveys for 15% of all single-family and multi-family residential customers. The District has targeted the top 20% of residential customers through a pilot program. Surveys were offered to residential customers through letters mailed to the highest 30% of water users. Each year this program is also promoted county wide through a summer media campaign, which typically includes television, radio and print advertisements.

The surveys include: educating the customer on how to read a water meter; checking flow rates of showerheads, faucet aerators and toilets; checking for leaks; installing low-flow showerheads, aerators and/or toilet flappers if necessary; checking irrigation system for efficiency (including checking for leaks); measuring landscaped area; developing an efficient irrigation schedule for the different seasons; and, providing customer with evaluation results, water savings recommendations, and other education materials. In 2004, the District began programming the homeowner's controllers as well (if allowed by the homeowner, the surveyors will input the recommended schedules into the controller).

Table 29, Water Wise House Calls

Water-Wise House Call Program						
Fiscal Year	**FY 00-01**	**FY 01-02**	**FY 02-03**	**FY 03-04**	**FY 04-05**	**Total**
Single Family	63	217	369	147	85	881
Multi Family	10	399	18	55	162	644
Total	73	616	387	202	247	1,525

Single-family landscapes

Single Family Landscape Audits are an integral part of the Water Wise House Call Program described under the Water Audit and Incentive Section of this UWMP. During the audit performed as part of the Water Wise House Call Program. The residential customer's irrigation system is evaluated for leaks, watering uniformity, and efficiency. The residents are also provided annual watering schedule and the auditor will even reprogram the residents sprinkler controller if requested.

The City of Santa Clara is also on the cutting edge of using recycled water for irrigation of common areas and the front yards in a planned community. In September of 2004 the Rivermark development, a planned community of over 3000 residences, began irrigating the common area landscaping and front yards of all the homes with recycled water.

The City offers residents and those that maintain single family landscapes various programs to promote water conservation. These programs are available through the SCVWD. The programs include:

Nursery Program - The SCVWD created the nursery program in 1995 to provide educational materials through store displays

Water Efficient Workshops - Water Efficient Landscape Workshops are offered by the SCVWD each spring. The series consists of 4 consecutive class sessions that cover garden design, plant selection, irrigation system design, installation and maintenance techniques, and gardening with native species

Spanish Language Irrigation Workshops - These workshops, designed for landscape professionals, cover topics including irrigation controller programming, system scheduling, and irrigation troubleshooting.

Landscape Water Management Seminar - These workshops are designed for landscape irrigations professionals and cover training in irrigation system evaluation, water budgeting, and water use tracking. The workshop is typically offered once per year

Water Wise Gardening CD-Rom - In 2004/05 the SCVWD developed an interactive CD Rom that contains information on drought tolerant and water efficient plants. The CD features Garden tours and a Garden Gallery and allows the user to save and print lists of plants.

The programs described above are expected to continue as a means of insuring that single-family dwellings are irrigating in an efficient manner.

Residential Water Leak Check

The City also offers free leak checks to residential customers. A trained technician is sent to the residence to assist in determining if a leak exists at the property. Although the City has offered free leak checks for it's residents for many years, the City only began tracking the number of Leak Checks performed in 2003. In 2003 the City performed 167 leak checks and in 2004 the City performed 196 leak checks.

The City of Santa Clara Finance department monitors customer accounts for higher than typical water usage. Accounts that are found to have a higher than average water usage are referred to the Water Utility for follow up. The Water Meter Readers also report accounts with obvious signs of leakage or if the water meter appears to be running when the residence does not appear to be occupied. Follow up typically consists of one or more of the following

1) The water meter is re-read to confirm the high usage
2) A phone call to the resident to advise them of the higher than typical usage
3) The resident is offered a free leak check

Energy Star Dishwasher Rebate

The City of Santa Clara also offers rebates on "Energy Star" dishwashers. The program was established on July 1, 2000 by the City's electric utility, Silicon Valley Power. The rebate program has issued 2,034 rebates to date. Table 30 below indicates the number of rebates issued each year.

Typical new dishwashers use about nine gallons of water per load, while an average "Energy Star" qualified model uses six gallons per load, resulting in a savings of three gallons per load. Assuming an average of 322 loads per year, that translates to an annual water savings of 966 gallons per

machine per year[23]. Therefore the 2,034 rebates issued to date equate to approximate savings of 1,964,844 gal/year or 6 acre-ft/yr.

Table 30, Energy Star Dishwasher Rebates

Energy Star Dishwasher Rebate Program						
Fiscal Year	**FY 00-01**	**FY 01-02**	**FY 02-03**	**FY 03-04**	**FY 04-05**	**Total**
Number of Rebates	118	384	672	525	335	2,034

The program is funded for through July 1, 2006 however funding may be extended beyond that date.

Residential Plumbing Retrofits

In the previous UWMP, the City identified a past rebate program for ULFT's and a proposed program for distributing water conservation devices through public events, water audit participation, and upon request. The rebate program was modified over the course of the past five years, however the distribution of free low flow showerheads and aerators continues.

The City has distributed free low flow showerheads, faucet aerators, dye tablets for detecting toilet leaks, and automatic shut-off hose nozzles through public events, field technicians, the Water Wise House Call program, and at the front counter of the Utility offices in City Hall. From 2000 to 2004 the City has distributed 2,920 water conservation kits through direct distribution. Additional water conservation devices were distributed through the Water Wise House Call program detailed above.

Based upon a study recently completed by the District, Santa Clara County Residential Water Use Baseline Study (August 2004), the county is nearing the 75% saturation threshold and completion of this BMP. The study found countywide saturation rates of 59% for pre-1992 constructed single-family homes and 51% of pre-1992 constructed multi-family units. A CUWCC report estimates the average lifespan of a showerhead to be 3-7 years, and the average lifespan of an aerator to be 1-3 years[24]. Given that 13 years have passed since the efficiency standard was enacted, the District's study suggested that the county will achieve the 75% threshold in the near future through natural replacement. The study estimates that saturation will be achieved in 2006 for single-family and 2010 for multi-family residential.

The City plans to continue the distribution of free water conservation devices to residents that request them.

Distribution System

The City of Santa Clara tracks the difference between water produced or purchased and the amount of water sold to it customers. The difference, expressed as a percentage of total water produced, is referred to as unaccounted for water. The generally accepted industry standard for unaccounted for water is from 7% to 15% [25].

[23] On line source, http://www.fypower.org/res/tools/products_results.html?id=100125, accessed on 8/24/05
[24] BMP Cost & Savings Study; Guide to Data and Methods for Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices, California Urban Water Conservation Council, December 2003
[25] Water Resources Planning Manual of Water Supply Practices M50, American Water Works Association, First Edition 2001 pp 33-34

Unaccounted for water is attributable to flushing, leaks, fire fighting, street cleaning, and reservoir overflow. The City has an aggressive response to reports of leaks within the distribution system. Leaks are repaired upon discovery and repairs are generally completed in less than 8 hours.

In addition, the City has an aggressive program of replace problem water mains. Areas where leaks and main breaks occur at a higher frequency are put on a list and prioritized for replacement. The City replaced 57,323 ft of water mains between 2000 and 2004.

These programs have resulted in an unaccounted for water rate of 4 % or less. The percentage of unaccounted for water is shown below in Table 31 and Figure 18.

Table 31, Unaccounted for Water by Year

Unaccounted for Water by Year					
Year	2000	2001	2002	2003	2004
Percentage unaccounted for water	2.3%	1.4%	2.0%	2.7%	2.9%

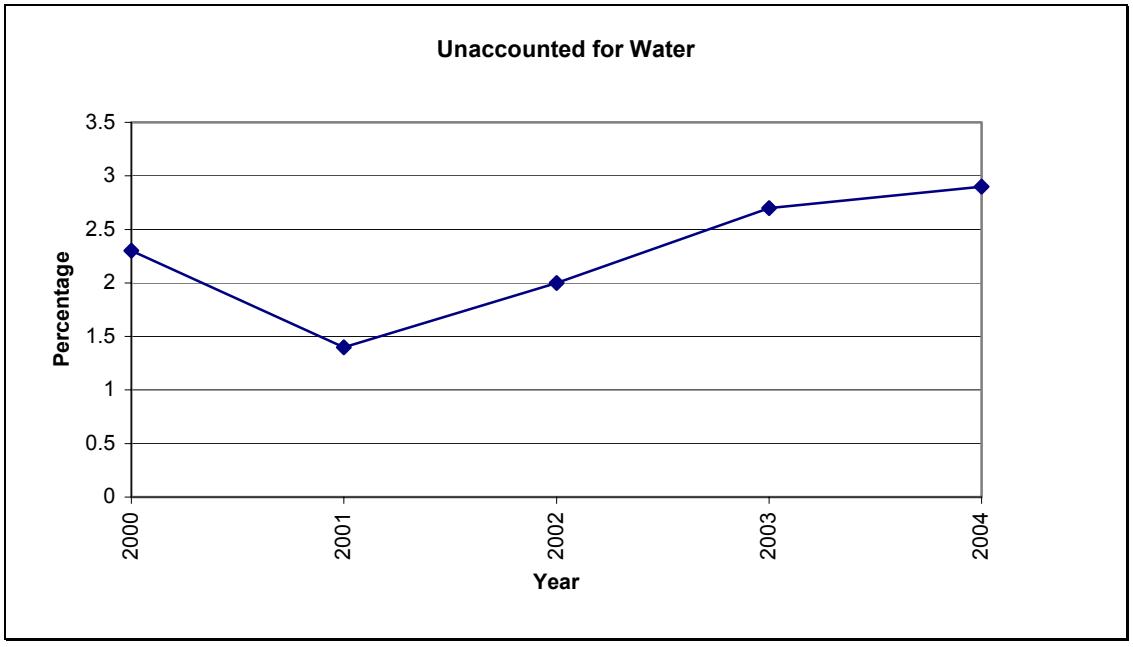

Figure 18 Unaccounted for Water

Metering and Commodity Rates

The City of Santa Clara requires meters on all connection to the water distribution system. Currently, there are no known unmetered connections to the water distribution system.

All new commercial, industrial, and multi-family developments are required to have dedicated water meters and separate accounts and meters for landscape irrigation. Retrofit assistance has been offered for those facilities that wish to convert mixed use water services to separate landscape and internal use water services. The retrofit assistance includes a rebate for the cost of the water meter and is offered through the Santa Clara Valley Water District. To date only two commercial facilities have taken advantage of this program.

Large Landscapes

Since 1995, the City has offered a free Irrigation Technical Assistance Program (ITAP) through the Santa Clara Valley Water District to sites with one acre or more of landscaping. The audits are provided through the Santa Clara Valley Water District that oversees and runs the program. A pre-screening mechanism was also incorporated which determines if the site is over budget or not prior to conducting a full-scale audit. Landscape managers are provided with water-use analyses, scheduling information, in-depth irrigation evaluation, and recommendations for affordable irrigation upgrades. Each ITAP site receives a detailed report upon completion of the audit. The District also generates an annual report that recaps the previous year's efforts. A specialized database is used to track water use history, meter numbers, account numbers, and site contacts and addresses are captured for each site where audits have been conducted. The database allows for several reporting and monitoring options.

The ITAP audits consist of 5 components:

1) A System Check – which includes an evaluation of the entire landscape irrigation system. A catch can test is performed to verify precipitation uniformity and average application rate.

2) Hydro Zones and Budgets – Auditors classify plant groups into hydro zones to estimate each areas actual water need. This results in an optimum water budget.

3) Scheduling and Tracking – Auditors provide a suggested yearly watering schedule and set up a system to log meter readings, calculate weekly water use and graphically compare current use to the proposed water budget.

4) Site Report – The site's property manager receives a report that evaluates the existing irrigation system and landscape water management. The repot also includes a plan detailing how the site's water use efficiency can be improved.

5) Follow Up Services – Auditors are available for follow up visits and consultations free of charge.

ITAP is promoted through advertising in Tri-County Apartment Association's monthly Apartment Management magazine, colorful flyers at the biannual Home & Garden Show, NCTLC Turf & Landscape Expo, the San Jose Mercury News, and retailer outreach through direct mailing of personalized letters to high water use customers and also through city newsletters and business newsletters.

56 ITAP evaluations have been completed in the City of Santa Clara since the program started. 27 of the audits were conducted between 2000 and 2004.

In addition, the City evaluates large area landscapes for conversion to recycled water. Large landscapes are typically the most economical to convert to recycled water. The routes of recycled water mains were determined in part by the concentration of potential customers along the pipeline routes. To date the City has converted 5 parks, 3 schools, a golf course, the City's cemetery and numerous commercial and industrial facilities to recycled water for irrigation of turf areas

The City also has an ordinance regulating conservation in landscaping. This ordinance applies to all new and rehabilitated landscaping for public agency projects and private development projects that require a permit; and developer-installed landscaping in single-family and multi-family projects. A copy of this ordinance is included in Appendix J.

The City plans to continue to offer both ITAP and recycled water to customers with large landscape areas.

High Efficiency Clothes Washer Rebate

The City offers rebates on high efficiency clothes washing machines through the SCVWD. Promotion of this program occurs through point of sale information and education of appliance retailers. To date 2,333 rebates have been issued. A breakdown of the rebates issued per year is shown below in Table 32. The CUWCC estimates that the average water savings for high efficiency clothes washers is approximately 5,100 gal/yr. Therefore, the 2,333 rebates issued to date equate to approximate savings of 11,898,300 gal/yr or 37 acre-ft/yr. The City plans to continue to offer rebates for high efficiency clothes washers.

Table 32, High Efficiency Clothes Washer Rebate

High efficiency clothes washer rebates											
Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Totals
Washer Rebates	1	21	47	118	235	229	320	422	576	364	2,333

Public Information

The City of Santa Clara has an active public education and information program to promote water conservation, which augments the district's very active public information program. This program takes the form of bill inserts, information on the customer bill, educational displays, special events, articles and information posted on the Utility web site and educational materials.

The City has a quarterly bill insert called Mission City Scenes for which the Utility writes informational and educational articles. These articles cover a variety of topics including water conservation.

All utility bills include a water usage comparison to previous years usage. In addition, each bill contains a chart shows the water usage over the previous 13 months. In 2004 the utility bills were redesigned to make the information more concise and customer friendly.

The Utility participates in an average of 5 public events per year. The Utility has a number of educational displays that are used in conjunction with educational handouts, games and interactions with staff to raise the water conservation awareness of event participants. The Utility also uses public events as an opportunity to distribute conservation devices.

Educational displays are also featured in a display case in the East Wing of City hall, typically during the month of May to coincide with Water Awareness Month. Educational displays make residents and businesses aware of the conservation programs and materials that are available. The display case is located in a high traffic area of City Hall and only a short distance from the Utility Offices. Permanent displays of free conservation literature and information are located in three areas of City Hall, near human resources, just outside the permit counter, and in the Water Utility offices. These literature displays are prominently located in highly visible areas and are maintained on a daily basis.

City staff writes water conservation articles for publication in the Santa Clara newspaper, Inside Santa Clara. These articles cover a number of conservation topics and typically four to six articles are published each year.

A complete list of articles and educational materials for 2000-2004 is included in Appendix K.

The City plans to continue the existing public information program.

School Education Programs

The District operates an extensive public information and education program directed at school age children. In 1994, the District's Public Information Office hired a full-time, fully credentialed educator who holds lifetime Teaching and Administrative Services credentials to coordinate the school education programs. This included developing school programs, contracting with the Youth Science Institute for additional instructors, and supervising university student interns as classroom assistants. In 2001 a second, bilingual educator joined the district's full-time staff to assist with the program.

The District has been continuously active in this area by providing free classroom presentations, puppet plays, and tours of district facilities to schools within the county. The objective is to teach students about water conservation, water supply, watershed stewardship and flood protection. The District also provides school curricula to area educators, including workbooks and videos, as well as hands-on training for teachers.

Materials distributed through the District's school program included "Water Colors" to students in grades Kindergarten and 1st grade, "Water Junction & Journal" to students in grades 2 and 3, "Rain to Drain" to students in grades 4 through 6, and "Project Water Science" to students in grades 7 through 12. All programs meet state education framework requirements and are grade-level appropriate. All students who participated in the programs received educational materials.

Table 33, Classroom Presentations by Fiscal Year

Classroom Presentations					
Fiscal Year	**01/02**	**02/03**	**03/04**	**04/05**	**Total**
Number of Classroom Presentations	37	56	33	28	154
Number of Students	873	1,339	1,068	844	4,124

In addition to the program run by the District, the City staff has outreach events that target school age children including an annual Earth Day/ Arbor Day event, which draws between 750 and 1000 children and their teachers from Santa Clara elementary schools and the Briarwood Elementary School Science and Community Faire which draws 100 to 150 children and their parents. These events allow for distribution of age appropriate educational materials to encourage water conservation and wise water use.

Commercial, Industrial, and Institutional Accounts

In the previous UWMP the commercial and industrial program described consisted of commercial and industrial audits, Irrigation Technical Assistance Program (ITAP), water conservation financial incentive program, and resource conservation information exchange program. The ITAP program was described in detail under the Large Landscape section of this UWMP. That description will not be repeated here.

Pre-rinse Spray Valve Retrofit Program

In FY 2002/03 The Santa Clara Valley Water District, with funding from the CUWCC and the California Public Utilities Commission, began a program to provide free water efficient pre-rinse sprayer valves and installation to restaurants and food service establishments. These spray valves save an average of 200 gallons of water per unit per day. To date 197 of pre-rinse spray nozzles

have been installed in facilities in Santa Clara. This retrofitting program is estimated to have resulted in water of 14,381,000 gallons per year or 44 acre ft/yr.

Audits

During FY 1996/97, the Santa Clara Valley Water District implemented a pilot program the provided 25 water use surveys to large water using businesses and industries. For the past two years the, the District has offered comprehensive Commercial and Industrial water use surveys. The comprehensive audits include a thorough review of water use on site, including landscaping, suggestions for potential water saving technology changes, and cost benefit analysis for each water conserving measure. The City continues to offer industrial and commercial audits through a program administered by the Santa Clara Valley Water District. To date, 13 audits have been completed within the City of Santa Clara.

Financial incentives

The City currently offers rebates of up to $50,000 through the Water Efficient Technology (WET) program. The maximum rebate is $50,000 per project or %50 of the project cost whichever is less. The minimum rebate is $400 per project. All commercial and industrial users within the City are eligible for the rebate. The rebate amount is based on the amount of reduction in wastewater flow resulting from the project. Proposed projects must reduce the wastewater flow by at least 100 ccf per year.

Table 34 below shows the associated demand reductions and rebates. Over the past 6 years the WET program has resulted in demand reductions totaling 381,088 gpd or approximately 427 acre-ft/year. Other WET rebates have been issued prior to 1999, which are not shown in the table below. Eight rebates were issued prior to 1999 for projects that decreased demand by an additional 211,444 gpd or approximately an additional 237 acre-ft/yr.

Table 34, WET Program Rebates

Date	Facility	Project	Rebate	Demand reduction (gpd)
6/17/2005	Intel Corp	RO Reject in cooling towers	$9,688	4,963
6/17/2005	Intel Corp	RO Reject in cooling towers	$48,492	24,844
6/17/2005	Intel Corp	RO Reject in cooling towers	$50,000	32,217
6/17/2005	Intel Corp	RO Reject in cooling towers	$31,672	16,226
5/25/2004	Reaction Technologies	Air scrubber retrofit	$28,545	16,890
6/27/2002	Intel Corp	Industrial wastewater reuse	$31,608	16,194
5/24/2001	Vishay Siliconix	RO reject reuse	$50,000	45,317
4/19/2001	Micro Chem	Closed loop chiller	$1,112	570
1/19/2001	Hadco Corp	Rinse modification	$47,988	24,586
1/19/2001	Hadco Corp	Rinse modification	$46,878	26,780
1/19/2001	Hadco Corp	Rinse modification	$47,601	26,446
10/13/2000	Hadco Corp	Automate a manual process	$476	244
3/31/2000	Hadco Corp	Rinse process improvements	$50,000	26,465
12/16/1999	Peninsula Coating Services	Industrial water recycled	$3,316	1,699
6/29/1999	Intel Corp	RO Reject reuse	$44,753	85,016
6/25/1999	Analog Devices	Upgrade DI water system	$36,648	18,776
5/14/1999	Intel Corp	Water reuse	$27,044	13,855
		Total	$555,821	381,088

Conservation Pricing

The City of Santa Clara Water Utility charges a set price per unit of potable water, referred to as a uniform volume charge. Residential, multi-family, commercial, institutional, and industrial currently all pay $1.813 per hundred cubic feet (ccf) of potable water. A monthly minimum charge varies based on meter size. The currently minimum charges for each meter size are listed below.

Table 35, Minimum Charges - Potable Water 2005-06

Water Meter Size	Minimum Charge
5/8 x 3/4 inch	$5.80
1 inch	$9.30
1½ inch	$16.30
2 inch	$23.10
3 inch	$66.00
4 inch	$93.00
6 inch	$182.00
8 inch	$280.00
10 inch	$346.00
12 inch	$445.00

The City of Santa Clara Water Utility also charges a set per unit price for recycled water. Recycled water is priced cheaper than potable water to encourage its use. The current price per hundred cubic feet (ccf) of recycled water is $1.042. The City further discounts the price of recycled water in the following special cases.

1. Landscape Irrigation Otherwise Served By A Private Well: Customers who receive recycled water from the City for landscape irrigation purposes and upon application and presenting evidence to the City that such water would otherwise be provided by a well which qualifies pump taxes levied by the Santa Clara Valley Water District, receive a credit of $0.326 per HCF for the quantities of water used.

2. Industrial Process Water: Customers who receive recycled water from the City for use in an industrial process, receive a credit of $0.234 per HCF for the quantities of water used.

3. Industrial Process Water Otherwise Served By A Private Well: Customers who receive recycled water from the City for use in an industrial process and upon application and presenting evidence to the City that such water would be otherwise provided by a well which qualifies for the pump taxes levied by the Santa Clara Valley Water District, receive a credit of $0.817 per HCF for the quantities of water used, plus a fixed rate of $50.00 per month.

A monthly minimum charge varies based on recycled meter size. The currently minimum charges for each recycled meter size are listed below.

Table 36, Minimum Charges – Recycled Water 2005-06

Water Meter Size	Minimum Charge
5/8 x 3/4 inch	$5.40
1 inch	$8.60
1½ inch	$15.20
2 inch	$21.60
3 inch	$61.70
4 inch	$86.50
6 inch	$169.80
8 inch	$261.80
10 inch	$323.40
12 inch	$415.40

This existing rate structure facilitates conservation since customer bills vary directly with the level of water usage[26]. The Uniform Volume Charge also provides a clear and easy to understand price signal to the customer. To date the utility has avoided an inverted rate block structure in order to preserve this option for use during a prolonged drought. As noted earlier in this plan, the City's utility billing system is capable of implementing tiered water rates and different rates and tiered can be established based on account type.

Conservation Coordinator

At the time that the previous UWMP was written, the City was recruiting for the position of water resource planner. The water resource planner position was created by reclassifying the City's previous water conservation coordinator's position. A Water Resource Planner was hired in January of 2001.

The water resource planner was responsible for control and administration of existing water supply programs, recycled water distribution, drought contingency planning, supervision and promotion of conservation programs directed to private and commercial customers as well as financing and budgeting for the water conservation programs.

In 2005, the City created the position of water and sewer compliance manager to replace the water resource planner's position. There are several distinct differences between the former and latter positions. The water resource planner was an hourly employee whereas the compliance manager is a management level position.

The compliance program manager's position is responsible for managing;

- Demand side management programs for the water utility,
- Water quality program,
- Environmental, health, and safety programs

[26] Principles of Water Rates, Fees and Charges, AWWA M1 Manual, Fifth Ed., p. 87

Management of the demand side management programs is expected to comprise 25% of the compliance manager's time. The compliance manager was hired on September 11, 2005.

Water Waste Prohibitions

The City of Santa Clara has had water waste prohibitions in place since the 1989-1992 drought.

Below is an excerpt from the City of Santa Clara Water Service and Use Rules and Regulations prohibiting water waste.

> **"1.C WATER USE RESTRICTIONS AND PROHIBITIONS**
>
> The following list of Water Use Restrictions and Prohibitions are specific measures which prevent water waste and achieve reasonable, yet substantial, reductions in water use by all users in the City.
>
> The following uses of water are prohibited by the City:
>
> (a) Wasting water, which includes but is not limited to, the flooding or runoff on City sidewalks, gutters, and streets.
> (b) Cleaning of sidewalks, driveways, patios, parking lots, or other paved or hard-surfaced areas, or washing cars, buses, boats, trailers, or any vehicle by use of a hose unless that hose is fitted with an operating automatic shut-off valve.
> (c) Water waste due to broken or defective plumbing, fire system, irrigation system, or any appurtenance thereto; or to open or to leave open any stopcock or faucet so as to permit water waste.
> (d) Service of water by any restaurant unless requested by a patron.
> (e) Installation of a single-pass cooling system.
> (f) Installation of a non-recirculating, decorative fountain.
> (g) Construction of a non-recirculating conveyor car wash."

When water waste is reported and verified, a warning letter is sent to the party responsible for the water waste. If water waste continues the City can take further action including additional warning notices, administrative penalties of up to $5000, or termination of water service. The City has also terminated water service in the case of egregious water waste.

Ultra Low Flush Toilets

The District launched two new program elements in 2000: full-service installations targeted to large multi-family property owners and ULFT distribution events targeted to single-family residents. The estimated net cost (after cost-sharing) to the District for these programs was approximately $85-90 per toilet for multi-family properties and $95-100 per ULFT for single-family residents. In 2001, the District again switched their focus, this time from a ULFT distribution program for single-family residents to a full installation program for elderly, disabled and low-income single-family residents (the multi-family program remained unchanged). Finally, in 2004 the District shifted to a rebate program for high-efficiency toilets (HETs) that use even less water than conventional ULFTs.

Table 37, ULFTs

Fiscal Year	Commercial Industrial ULFTs	Single Family ULFTs	Multi-Family ULFTs	Total
00/01	33	0	22	55
01/02	77	354	46	477
02/03	266	237	226	729
03/04	3	0	0	3
04/05	60	0	0	60
Total	439	591	294	

The amount of water conserved by installation of ULFTs in residential settings can be made assuming an average of 4 flushes per day and an average savings of 3.9 gallons per flush[27], that translates to an annual water savings of 5,694 gallons per toilet per year. Therefore the 885 residential rebates/installations to date equates to approximate savings of 5,039,190 gal/year or 15 acre-ft/yr.

The amount of water conserved by installation of ULFTs in commercial/ Industrial settings can be estimated assuming a savings of 37 gallons per day per toilet[28] based on a average of industry types. The 439 toilets installed would equate to water savings totaling 5,928,695gallons per year or 18 acre-ft/yr.

[27] BMP Cost & Savings Study; Guide to Data and Methods for Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices, California Urban Water Conservation Council, December 2003

[28] BMP Cost & Savings Study; Guide to Data and Methods for Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices, California Urban Water Conservation Council, December 2003

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